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AIR FLEET

International aerospace review

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The MAKS 2003 International Aviation and Space Salon is, without exaggeration, the top event of the year for Russia's aerospace community. Staged for a sixth time, in 2003 the biennial air show will boast an exhibitor list of nearly 700 companies from 38 countries, and an exposition of about 200 static and flying aircraft. For the first time in the salon's history its international status will be confirmed by demonstration of foreign-made warplanes and displays by foreign aerobatic teams. We expect the air show to be honoured by the presence of the world-famous Patrouille de France and Frecce Tricolori display teams; USAF fighters and even a B-52 strategic bomber, as well as other foreign aircraft, are also awaited. MAKS 2003 will be visited by 30+ foreign air forces delegations.

But Russia's own aerospace achievements will undoubtedly be in the spotlight. This year's MAKS focuses on modernisation solutions for fourth and third generation warplanes, new developments in military and civil aviation, and international aerospace cooperation. The Russian exposition will showcase the entire range of upgraded Sukhoi warplanes, from the Su-25SM attack aircraft and Su-24M2 bomber to the Su-27SM fighter, which is currently undergoing trials, and other models of the Flanker family. Russian Aircraft Corporation MiG will demonstrate several developments from its legendary MiG-29 fighter. Mil and Kamov helicopter manufacturers will roll out a number of modernised helicopters.

We are also looking forward to seeing a plethora of recent developments. Quite a number of new aircraft have lately been built across Russia and the CIS: the Mi-38 medium utility helicopter and Aktay light helicopter in Kazan, the second Tu-334 passenger jet prototype in Kiev, the first pre-production Yak-130 combat trainer in Nizhny Novgorod, the new Tu-204-300 long-haul airliner in Ulyanovsk, the first production Be-200SCh amphibian in Irkutsk, etc. On-going trials might prevent some of these novelties from presence at MAKS, but they will undoubtedly become the talk of the show.

Russia's aerospace industry, which has long been hibernating after the calamities of the early 1990s and only survived thanks to the Soviet-era heritage, is now showing evident signs of revival. National manufacturers will use MAKS 2003 to roll out a host of developments. Some of the brand-new aircraft and modernised versions are still being tested or prepared for their maiden flights, deliveries of others are already underway.

MAKS offers aerospace developers and manufacturers a unique opportunity of showcasing their products and reach agreements on promising contracts with both domestic operators and potential foreign customers, who traditionally favour the Zhukovsky air show. Russia's recent breakthrough aerospace contracts with China, India, Malaysia and Indonesia will certainly raise international interest in MAKS 2003: foreign countries are no longer satisfied with merely purchasing Russian aircraft. The current global tendency is to aim at joint development and production, and participate in all sorts of international aerospace projects. Having set the course towards integration with the international aviation community, Russia is now ready for such cooperation. There are examples, such as the joint Russo-French MiG-AT project, the RRJ programme, the world's best Su-30MK series fighters fitted with a mix of indigenous and foreign-made equipment, international space exploration programmes, etc.

We hope that all MAKS 2003 exhibitors and guests have their share of interesting meetings, useful contacts and profitable contracts – and, of course, that they enjoy brilliant displays by the world's best pilots flying the world's best aircraft!

Andrei Fomin,
Editor-in-Chief

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Military aviation

Swifts and Russian Knights fly-past over the Red Square

The 12 June 2003 Russia Day was celebrated by a parade and procession on Moscow's Red Square. The hit of the festivities was a ten-ship fly-past above the Red Square by the RusAF Swifts and Russian Knights aerobatics teams. All kinds of air traffic over the center of Moscow were banned for more than 50 years: the last Red Square air parade was held on 1 May 1951. This year, the best two RusAF display teams were entrusted with demonstrating their skills in the sky of Moscow.

The ten-ship "pyramid" formation, with six MiG-29s in the front and four Su-27s in the back, flew at an altitude of 600m over the Red Square at 12:53 local time. The pilots then saluted Muscovites with flares and pulled a steep climb to go to the Moscow suburb Chkalovsky airfield. The entire Chkalovsky – Sheremetyevo – Tverskaya street – Red Square – Vasilievsky spusk – Chkalovsky route took the formation around 22min to cover. After the landing at Chkalovsky the pilots refuelled and flew to the Andreapol airfield in the Tver Region, where both teams are temporarily stationed while the runway at their Kubinka home base is being repaired.

The following pilots of the Swifts team did the fly-past: Colonel Nikolai Dyatel, squadron commander, and Lieutenant Colonel Igor Kurilenko, navigator – team leader, MiG-29UB No. 01; Colonel Gennady Avramenko and Lieutenant Colonel Dmitry Koposov – left wingman, MiG-29UB No. 02; Lieutenant Colonel Mikhail Loginov – right wingman, MiG-29 No. 03; Lieutenant Colonel Viktor Selyutin – centre wingman, MiG-29, No. 04; Lieutenant Colonel Vadim Shmigelsky – left edge wingman, MiG-29 No. 05; Lieutenant Colonel Igor Sokolov – right edge wingman, MiG-29 No. 06. The four Su-27s of the Russian Knights were piloted by the following officers: Lieutenant Colonels Igor Shpak and Oleg Yerofeyev – left outer wingman, Su-27UB; Colonel Igor Tkachenko, squadron commander, and Lieutenant Colonel Andrei Alekseyev – left inner wingman, Su-27UB; Lieutenant Colonel Dmitry Khachkovsky – right inner wingman, Su-27; Lieutenant Colonel Oleg Ryapolov – right outer wingman, Su-27.

RusAF Commander holds news conference

On the eve of the 12 August Air Force Day, Col General Vladimir Mikhailov, Commander-in-Chief of the Russian Air Force, held a traditional news conference.

General Mikhailov and Major General Dmitry Morozov, Deputy Air Force Commander for Armament, told attending journalists about the extensive exposition the Russian Air Force will set up at the upcoming MAKS 2003 air show. The exposition will include the entire range of fixed-wing aircraft and helicopters that are currently in service or undergoing modernisation, and also prospective aircraft expected to enter service in the near future – from modernised Tu-160 and Tu-95MS strategic bombers to Yak-54 and Yak-52M trainers. Air Force Command holds special hopes for the new Su-27IB (Su-32) front-line bomber, which in 2002 accomplished the first phase of the official test programme and was approved for production entry; for the Yak-130 combat trainer, whose deliveries to Air Force schools will start in 2005; and for the Il-76MF military transport, which successfully accomplished the official testing programme on 21 April 2003.

When speaking of the Air Force plans to modernise in-service aircraft, General Mikhailov praised the successful programmes to upgrade Su-27 fighters, Su-25 attack aircraft, Su-24 front-line bombers, and also Mi-8 and Mi-24 helicopters. Modernised Su-24M2 bombers and Mi-8MTKO helicopters have already entered service, and the first upgraded Su-27SMs, Su-25SMs and Mi-24PNs will be delivered to the Air Force in 2003-2004. The MiG fighters modernisation programmes are progressing somewhat slower than those for Sukhoi-built warplanes, but the first upgraded MiG-29SMT fighters and MiG-31BM interceptors will be delivered to the Air Force already in 2004. Similar programmes are underway for long-range aircraft: Tu-160 and Tu-95MS strategic bombers will shortly get a new long-range missile, which has nearly accomplished tests, and will be fitted with smart bombs and advanced avionics.

General Mikhailov said that the Mi-28N helicopter has recently won the Air Force's tender for a prospective combat helicopter. Rostvertol has already launched Mi-28N production, and the Air Force expects to take around 50 helicopters by 2010. A number of Ka-52 helicopters will be delivered to Air Force special units. The Air Force considers the possibility of purchasing Ansat and Ka-60 utility helicopters.

General Mikhailov links development of military transport aviation to the service entry of new Il-76MF transports, whose production has been launched at the Tashkent Aircraft Production Corporation, Uzbekistan, and may shortly be deployed at the Voronezh-based VASO Plant in Russia. The Il-76MF complies with all Air Force requirements of a transport with around 50t payload capacity, and costs nearly 80 per cent cheaper than the analogous An-70, whose flight tests were terminated by the Russian Air Force on 25 February 2003 to eliminate a number of structural flaws (first of all those in the power plant). The in-service Il-76MD fleet will be modernised to the Il-76MD-90 level through replacement of the original D-30KP engines with PS-90A-76s, which meet ICAO Chapter 4 requirements. The fleet of An-26 aircraft will be replaced by the Il-112V light transport, which has recently won the corresponding contest. The Il-112V is expected to perform the maiden flight in 2006 or 2007. The An-12 transports may in the long run be supplanted by the Il-214 medium transport aircraft.

General Mikhailov told journalists that the new S-400 air missile defence system accomplished official tests in July 2003 (so far with only one SAM type), and will enter service with the Air Force in 2004.

Industry

First production Be-200ChS takes off

On 17 June 2003, the first production Be-200ChS amphibious aircraft took off for its maiden flight from the Irkut Corporation airfield. The aircraft was piloted by test pilot N.P. Kuleshov with Beriev company and senior test pilot L.G. Smely with Irkut Corporation. During the 52-minute flight the aircraft behaved properly in all flight modes.

The first flying Be-200 and the first Be-200ChS (which is the second flying prototype of the type) are currently undergoing flight and certification tests at Beriev's flight test complex.

The first production Be-200ChS has already passed the first water tests: it did a series of take-offs and landings at the Irkutsk reservoir and performed water dumping routines. The test programme was accomplished in late July 2003, and on 1 August the aircraft was delivered to the Russian Ministry of Emergencies.

In May 2000, Irkut Corporation (then the Irkutsk Aviation Industrial Association) signed the contract to deliver seven Be-200ChSs to the Ministry of Emergencies. One more aircraft will be delivered in 2003, with the rest of the batch scheduled for deliveries by late 2005.

Fifth generation fighter conceptual design to be submitted in 2004

According to Yuri Koptev, Director General of the Russian Aerospace Agency, the conceptual design for Russia's fifth generation fighter will be developed by year-end and submitted in the first quarter of 2004. Said Mr Koptev, "We have already received the conceptual design specifications from the Russian Air Force. Under the original schedule, which we haven't revised, the new fighter will make its maiden flight in 2006." Mr Koptev says tenders have been held to identify participants of the programme, "and we have selected a number of businesses to join the Sukhoi Design Bureau on the project."

He said Ramnskoye Design Company and Aerospace Equipment Corporation had won the contest to jointly develop the avionics suite for the new fighter. A separate two-stage programme will be run to develop engines for the fighter. The first programme stage will cover modernisation of the AL-31F engine and enhancement of its thrust, whereas the AL-41F engine will be used at the second stage.

A full-scale organic engine will be developed after the construction of the first prototype of the fighter. Said Mr Koptev, "We will not hold a contest for development of a new engine; the government has already decided that the fighter will be powered by AL-41F engines developed by NPO Saturn".

Winner of short- and medium-range aircraft tender

The Rosaviakosmos Russian Aerospace Agency's feasibility tender for a prospective short- and medium-range aircraft was won in late July 2003 by the MS-21 project, under development by the Yakovlev and Ilyushin design bureaus.

Rosaviakosmos launched the tender in autumn 2002 under the federal programme to develop Russian civil aircraft for the period of 2002 to 2010 and through to 2015. The MS-21 ran along with the Tupolev Tu-204-300 (Tu-234) and Il-214 (Ilyushin and Irkut Corporation) projects.

The MS-21 project is based on Yakovlev's development under the Yak-242 programme. The baseline design is expected to be developed into a family of passenger aircraft comprising the MS-21-100 132-seater, the MS-21-200 that will seat 156, the 174-seat MS-21-300 and a cargo version. The MS-21 may be powered by prospective Russian-made PS-12 turbofan engines or foreign analogues. The Ulyanovsk-based Aviastar plant and Voronezh plant are being considered as manufacturers of the new aircraft.

Irkut to produce Yak-130?

Irkut Corporation aspires to expand its product range within the next five to ten years. The Corporation considers prospective projects led by Russia's major aircraft design bureaux for the purpose of identifying the possibility of using them in its future production plans.

Irkut's current primary products are Su-30MKI and Su-27UBK aircraft being built for export, but analysis shows that the demand for these aircraft may drop dramatically after 2010 or 2012. Irkut, therefore, is seeking new prospective aircraft to phase in.

In May 2003 Irkut's Board of Directors was replenished by representatives of the Yakovlev Design Bureau, namely President Oleg Demchenko and Director General Aleksandr Yefanov. No definite decisions have yet been made: the parties are merely outlining possible lines of cooperation, first of all joint efforts under the programme to launch production of the Yak-130 combat trainer.

By late 2003 Irkut intends to prepare a business plan for production of the Yak-130 and its modifications. The possibility cannot be ruled out that Irkut Coporation will join Yak-130 production at the Nizhny Novgorod-based Sokol Plant.

MiG testing thrust vector control for MiG-29M, new wing for MiG-29K

MiG Russian Aircraft Corporation in early August launched flight tests of the MiG-29M No. 156 (MiG-29OVT) prototype powered by the RD-33 engine with a 3D thrust vectoring nozzle. The aircraft was first demonstrated on static display of the MAKS 2001 air show, but did not enter the flight test programme until summer 2003.

The Corporation has also recently launched a flight test programme for the MiG-29K No. 311 shipborne fighter prototype with increased high-lift devices. Pictures: newly camouflaged MiG-29OVT mounting one RD-33 TVC experimental version; MiG-29K with modified wing on landing approach during a test flight.

New Sukhoi board of directors

The shareholders' meeting of the Sukhoi Design Bureau has elected a new Board of Directors, comprising Mikhail Pogosyan, Boris Bregman, Aleksandr Klementyev, Aleksei Knyshev, Sergei Sergeyev (all of them of Sukhoi AVPK), Sergei Chemezov, Aleksandr Mikheyev (Rosoboronexport), Denis Manturov (Oboronprom Corporation) and Yuri Tufanov (New Programmes and Concepts). Mr Bregman, Sukhoi AVPK Deputy Director General and KnAAPO Deputy Director General, was elected chair of the Board.

New Beriev board elected

The 14 July shareholders' meeting of Beriev company elected a new Board of Directors comprising Adulzhelil Abdulkerimov (Russlavbank), Evgeny Ageyev (Sukhoi AVPK), Valery Bezverkhny (Irkut Corporation), Vladimir Chirikov (Irkut Corporation), Aleksei Fyodorov (Irkut Corporation), Viktor Kobzev (Beriev), Vladimir Kovalkov (Irkut Corporation), Vladimir Prisyazhnyuk (Sukhoi AVPK) and Stanislav Rynkevich (Russian Aerospace Agency).

Development prospects for Russia's aircraft

At its 26 June session the Russian government discussed the plans to reform national aircraft industry. According to the Russian Aerospace Agency's document titled "On progress in reforming aircraft enterprises and organisations", which was submitted at the session, the national aircraft industry currently comprises 306 businesses, of which number 76 are state-owned enterprises (25 per cent) and 230 are joint-stock companies (75 per cent).

The 2002 production volume in the industry grew by 29.1 per cent against the 2001 level and reached nearly 150 bln rubles (around $5 bln), while the volume of assessments to budget were in the neighbourhood of 30 bln rubles (around $1 bln). The 2001 industry growth was 10.8 per cent. The aircraft industry currently accounts for more than 40 per cent of the entire production volume in the defence industry, and outputs around 60 per cent of overall defence produce.

In 2002, the industry delivered 67 aircraft, over 100 aero engines, various aircraft equipment, spares and accessories. The 2003 volume of aircraft equipment exports is expected to remain on the level of 2002, when it exceeded $3.2 bln (two-thirds of the entire volume of military exports).

The industry's main problem today is that many enterprises, especially those engaged in civil aircraft production, stand idling. In this connection the government has adopted a federal target programme to reform and develop the defence industry in 2002 through 2006. The programme was developed by the Ministry of Industry, Science and Technology jointly with the Russian Aerospace Agency and other defence industrial agencies.

As Assistant Prime Minister Boris Aleshin told journalists after the session, the government and private aircraft construction businesses will prepare, by year-end, a comprehensive project to create a single nationwide aircraft construction company. Mr Aleshin said this would help the state concentrate resources, boost aircraft production and unify technology solutions enabling the industry to attain additional capabilities. He added that the creation of a single company would merge private businesses with state resources, attract investment and position Russia more appropriately in the international aircraft market. Mr Aleshin noted that Chinese, Indian and Ukrainian aircraft builders might become partners in the establishment of Russia's national aircraft corporation.

The government's 2004 plans include corporalisation of MiG Russian Aircraft Corporation and Sukhoi AVPK, and also consolidation of Tupolev and Ilyushin. This will be followed by the establishment of 19 holdings, including six or seven helicopter and fixed-wing aircraft manufacturers. These holdings will comprise around one half of the 306 Russian aircraft enterprises. Only then will Russian aircraft manufacturers gradually merge into a single corporation.

The second Tu-334 rolled-out in Kiev, while MiG to start Tu-334 deliveries in mid-2004

The first Tu-334 built by the Kiev-based Aviant plant was rolled out on 2 August. After the maiden flight scheduled for 30 September the aircraft will join the Tu-334 certification programme. Another four aircraft of this type are currently under construction at Aviant, and might be handed over to MiG Russian Aircraft Corporation for final assembly.

The MiG Russian Aircraft Corporation is ready to deliver the first Tu-334 in June 2004. Presently, the Tu-334 programme is funded basically at the expense of MiG's export profits. Money invested under the federal programme is used for certification tests. MiG provides funds for the Tu-334 series production at its Lukhovitsy-based plant and for assembly of the third aircraft for certification tests.

Certification of the aircraft is likely to be over in the late 2003, while the production certification - in May 2004. In three to four years the plant will be capable of manufacturing 30 aircraft annually. It is necessary to have an order book for 100 planes in the coming five years to start serial production.

NIIP testing first APAA modules for fifth generation fighter

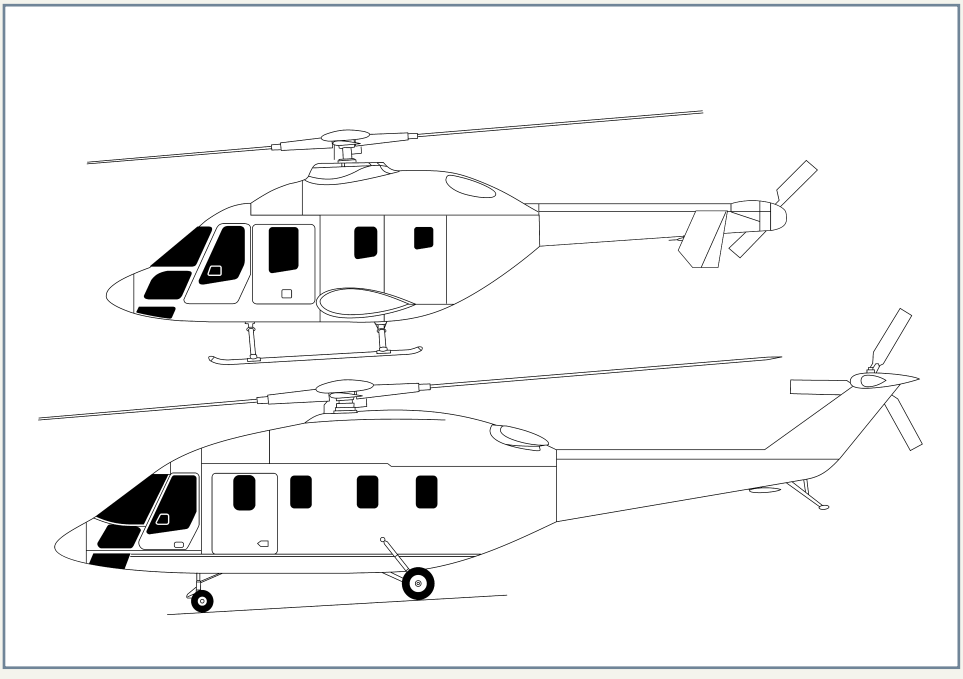
The Zhukovsky-based Tikhomirov Instrument-making Research Institute (NIIP) in June manufactured and commenced laboratory tests on the first active phased array antenna (APAA) modules for a prospective radar being developed under the fifth generation fighter programme. NIIP, a member of the Aerospace Equipment Corporation, has won the tender to develop the radar for Sukhoi Design Bureau's new generation fighter.

In early July, another phase of flight tests was accomplished in Akhtubinsk on the NIIP-designed Panda modernised radar sighting system, designed for installation in Su-30MK2 and Su-27SM aircraft. NIIP is currently launching development of the Irbis radar control system, to be built around a rotatable passive phased array, for use as part of the weapon control system in Su-35 and Su-37 fighters. These warplanes are planned to fill the market niche between the current Su-30MK and the fifth generation fighter, whose deliveries will not begin until 2010 or 2012. Our readers will be able to learn more about NIIP's business activities in our next issue, where we will publish an interview with NIIP Director General Yuri Bely.

Kazan Helicopters are making the Ansat longer

Kazan Helicopters company intends to continue the success of its light helicopter Ansat and to occupy the niche of little heavier helicopters. The mock-up of Ansat Maxi designed for carrying 17 passengers to 850-950 km is to be shown for the first time during MAKS'2003. The helicopter resembles only a little the original Ansat, but it makes use of all possible elements of its smaller brother, particularly the systems and some of the assemblies. The fuselage is longer than in the original, but its cross section is the same. The main rotor has been enlarged but it has also four blades, whereas the tail rotor has three blades instead of two in the small Ansat. The design bureau of Kazan Helicopters prepared the pilot project of Ansat Maxi, as well as the full-size size mock-up. The continuation of the work will depend on the interest of possible customers.

Ansat is the first helicopter designed by Kazan Helicopters company, known mainly as the manufacturer of popular Mi-8 and Mi-17. The flight tests of Ansat began four years ago, on 17 August 1999. Many alterations in the helicopter design have been introduced as the result of tests with two prototypes. The improved third prototype of Ansat took-off on 27 December 2001; the certification tests with this variant began on 31 October 2002. On 14 September 2001, Russian air forces ordered next generation light training helicopter Ansat-U. The beginning of Ansat-U tests is planned for the second half of 2004. Kazan Helicopters are also working with intensity on a combat version of Ansat.



IL-38SD entered flight tests

Prototype of upgraded Il-38SD maritime patrol aircraft (MPA) for Indian Navy took-off on 3 July afternoon from Khodynka airfield situated near the centre of Moscow. In its first flight, the Il-38SD was piloted by the crew of Vladimir Irinarkhov. The Il-38SD took-off with the fuel limited to three tones and without superstructure for electronic support measures device, which was dismantled in order to make the take-off run as short as possible. The aircraft flew to Zhukovsky, where the final equipment will be made, and then painting in the neighbouring civil 402nd aviation repair plant in Bykovo. The prototype will be delivered to India before the end of this year. Modernisation of the remaining four aircraft for Indian Navy will be carried out in Indian factories.

From 1960s on, the Khodynka airstrip is no more used in regular way, except such special events like recent one. In the vicinity of the airfield there are experimental workshops of Ilyushin design bureau that has carried out the Il-38SD modernisation (other air industry enterprises situated there are RAC MiG's Voronin Production Centre and Sukhoi design bureau). The Khodynka area is now quickly developed with housing, so depart of Il-38SD was one of the last (if not the last at all) take-offs made from this airfield. In two years, a prestige housing estate will be built here. Khodinka airfield is of great sentimental importance for Russian aviators and especially for Ilyushin company. All Ilyushin aircraft from the first TsKB-26 of June 1935, took-off for the first time from this location. By the way, Il-18 passenger airliner (used later as a platform for Il-38 anti-submarine aircraft) flew for the first time from Khodynka on 4 July 1957, almost exactly 46 years before Il-38SD.

Il-38SD has been equipped with a the Sea Dragon mission system, being an export version of Russian Novella ASW system for Il-38N aircraft. The core of Sea Dragon system is computer operation centre with two system operator posts. Each post is equipped with two 13-inch colour LCD monitors, as well as operator's console. The third post for the system commander has only one big display and control console. The digital equipment is integrated via common data transmission bus compatible with Mil Std 1553B and ARINC-429D. Thanks to the bus, the equipment configurations can be easily changed including third-party equipment. The system organisation enables its operation even in case of failure of some modules.

Upgraded Il-38SD with a new mission system is no longer narrowly specialised anti-submarine warfare aircraft only, but also a maritime patrol aircraft capable - apart of detecting and attacking submarines - of patrolling the coastal zone, performing electronic reconnaissance, research and rescue missions, as well as detecting and attacking the surface targets.

India submitted to Russians the need of modernisation of its Il-38s as early as in 1995. In September 2001, Rosoboronexport signed the contract for upgrading five Indian aircraft before end 2004 for $205 million. The first aircraft to be upgraded, the IN-305, came to Moscow on 29 March 2002.

In 1977, India purchased in USSR five Il-38 aircraft marked as IN-301 to IN-305, which are operated by Indian Navy Air Squadron (INAS) 315 at Dabolin, Goa. On 1 October 2002, two Indian Il-38s collided with each other in air. In early 2003, India ordered two more aircraft from Russia for compensation of this loss; these aircraft will be handed-over to India from the aircraft fleet of Russian Navy.

Tests of the Il-38N upgraded aircraft for Russian naval aviation with Novella mission system are continued at the same time. According to the sources in Russian defense industry, Sea Dragon export system is a version of Novella "with limited set of sensors and with simplified software". An Il-38N upgrade prototype with mock-ups of the equipment took-off for the first time in spring 2001. The state acceptance tests of this prototype with full equipment are continued since November 2002. These tests will be completed near the end of 2003 and then 20th aircarft repair plant in Pushkin near St Petersburg will upgrade most Russian Navy's Il-38 aircraft to the Il-38N standard. Presently, Russian Navy has about 10 Il-38s in the Northern Fleet, about 15 in the Pacific Fleet and several aircraft at the combat training centre at Ostrov (Pskov region).

Second An-148 under construction

Antonov ASTC has launched construction of the second prototype for the new An-148 regional passenger aircraft. Prefabricated airframe parts and a set of cockpit canopy frame, manufactured by Kharkov State Aircraft Manufacturing Company (KSAMC), were in late May delivered to Antonov's production facilities.

Simultaneously with that, Antonov continues construction of the first An-148 aircraft, expected to be finished in late 2003. On 28 February 2003 the airframe was extracted from the company's assembly line. KSAMC is currently assembling the centerplane and preparing for assembly of the outer wing, flaps, ailerons, spoilers, empennage and landing gear. The fin and stabiliser are nearly assembled, and production of doors and cargo hold hatches is underway.

The An-148 will be powered by D-436-148 turbofan engines, currently being produced by Ukrainian and Russian enterprises. Final assembly and testing will take place at Motor Sich JSC and Ivchenko Progress Design Bureau.

Throughout the An-148 programme Antonov has been contacting Ukrainian and Russian airlines to maximally adapt the new aircraft to requirements of potential operators.

First Russian-assembled An-140 to take off by year-end

The Samara-based Aviacor aircraft plant expects to have assembled the first An-140 short-haul passenger aircraft by December 2003. The plant will be assisted by specialists of Kharkov State Aircraft Manufacturing Company (KSAMC), who have already commissioned five aircraft of this type. Aviacor launched An-140 production in 1995, but has not yet built a single machine. On 4 July, a KSAMC delegation, Aviacor top management and Samara Governor Konstantin Titov held a meeting to boost An-140 production. The parties discussed the organisational option of promoting KSAMC to managing position in its relations with Aviacor.

New modification of K-36 ejection seat

Zvezda Scientific Production Enterprise has developed the new generation K-36D-3.5E ejection seat, which surpasses all foreign analogues.

When used with protection suit and the KKO-15 oxygen system, the seat facilitates professional pilot tasks, including manoeuvres of up to 9g. It can be used for safe bailout in all flight modes, in the altitude envelope of 0…20km, instrument speeds of 0…1,300km/h and Mach number up to 2.57. If used with protective suit and the KKO-5 oxygen system, the seat enables safe bailout in the envelope of altitudes of 0…25km, instrument speeds of 0…1,400km/h and Mach number 3.

The K-36D-3.5E is a development from the K-36DM ejection seat, which is installed in the Su-27 and MiG-29 fourth generation fighters and their modifications. The ergonomic seat features enhanced bailout safety, especially at very low altitudes, in dynamic flight modes and unfavourable aircraft attitudes. The K-36D-3.5E is smaller and 25kg lighter than the baseline model. Its weight, without the oxygen system and emergency kit, is only 80kg.

Modular design allows for development of a "3.5" ejection seat family for installation in bombers, assault aircraft, jet combat trainers and VTOL aircraft. Further modernisation is planned for installation in the fifth generation fighter.

The entire "3.5" seat family is compatible with foreign-made protection gear, oxygen systems and individual restraint systems, and can be installed in foreign aircraft.

Tu-204-300 construction nearly accomplised

The Ulyanovsk-based Aviastar-SP plant is accomplishing construction of the first prototype for the modified Tu-204-300 aircraft, which is a long-haul short-fuselage version of the Tu-204. The Tu-204-300 is expected to have the maximum range extended from 6,500km to 9,250km.

Mi-24PN undergoing tests

The Mi-24PN modernised combat transport helicopter is undergoing official tests at the Russian Air Force's State Flight Test Centre in Akhtubinsk. Rostvertol PLC has been contracted by the Defence Ministry to modernise eight Mi-24Ps into the Mi-24PN gunships capable of night operations. The helicopter mounts the Raduga-Sh guidance device coupled with the Zarevo IR imager developed at the Krasnogorsk Zverev Plant.

Civil aviation

FLC board elected

The annual shareholder meeting of the Finance Leasing Company (FLC, Moscow) has elected an 11-man strong board of directors, including Vice Deputy Finance Minister Sergey Vyazalov, Deputy Minister for Economic Development and Trade Yuri Isayev, Minister for Industry, Science and Technology Ilya Klebanov, Adviser to Minister for Property Relations Konstantin Makhov, Rosaviakosmos Director General Yuri Koptev, Deputy Chief of Rosaviakosmos Department Andrey Osipov, Deputy Minister for Economy and Industry of Tatarstan Sergei Mukhin, Chairman of the Zenit Bank Observation Board Robert Musin, JSC Tatenergo Vice Deputy Director General Gulsin Minnekhanov, Gorbunov KAPO Director General Nail Khairullin and FLC Executive Director Marsel Zaripov.

According to the business plan, approved by shareholders, KAPO will build 10 Tu-214 aircraft for FLC till 2007. In 2003 the first aircraft is going to be delivered. A contract has been signed to manufacture another four aircraft.

In 2001, FLC leased a Gorbunov-built Tu-214 to Khabarovsk-based Dalavia, thus becoming the first aircraft leasing company in Russia. In 2002, Dalavia got another aircraft on lease. In the long run, the air carrier plans to renew the aircraft fleet, and therefore considers a possibility of acquiring additional Tu-214. A single Tu-214 employed on the Moscow-Khabarovsk route allows the company to save up to RR500,000 (about $16, 000) on fuel.

Meeting in Domodedovo

Two large foreign air carriers have started regular services in the Moscow Domodedovo airport at once. British Airways shifted its Moscow flights from the Sheremetyevo airport to Domodedovo on 1 July, while Emirates (UAE) opened a new service from Dubai to Moscow.

British Airways will keep the existing air transportation between Moscow and London at 14 flights a week, while Emirates will fly to the Russian capital five times a week.

Ageing aircraft employment limited

In September 2003, the Ministry of Transportation, the International Aviation Committee (IAC) and the Russian Aviation and Space Agency are going to submit to the Russian government their proposals to reduce employment of ageing aircraft. The new limitations are to be in line with the noise and emission requirements and navigation principles, currently in force in many countries. "The West is replacing its fleet of obsolete aircraft in an energetic attempt to promote new aircraft in the market, rather than to bring them up to the ecologic requirements only," said Boris Alyoshin at a governmental session.

He added, "the process should provide for a period of adaptation, after which air carriers could make up their mind, find money and get prepared to replace the obsolete aircraft."

New air carrier from Rostvertol

The Rostov-based Rostvertol helicopter plant has founded the Rostvertol-Avia air carrier that will employ Mi-26Ts to transport heavy loads. Since there are few competitors in this market niche, Rostvertol has good chances to capture the leading position.

Utair wins tender

UTair has won a tender on providing transportation support to the UN mission in Sierra Leone. The contract was signed for one year with possible prolongation for another two years. It provides for employment of two Mi-26 helicopters.

Currently, UTair delivers helicopters to peacekeepers in East Timor, West Sahara, Congo and Eritrea. As of today, there are 13 aircraft of UTair make in UN peacekeeping missions.

Russian team wins seven gold medals

The Russian national team was recognised an absolute winner at the world aerobatics championship held in Lakeland (Florida, USA) in June. The Russians won 19 of the 24 medals in the team championship, including 7 of the 8 gold ones, 6 of the 8 silver ones, and 6 of the 8 bronze ones.

The Russian team are Sergei Rakhmanin, Aleksei Krotov, Mikhail Mamistov. They scored 29,600 points. The French team came second with 29,087 points, while the Americans ranked third. Where individual men's aerobatics are concerned, Sergei Rakhmanin became the world absolute champion, while Aleksei Krotov came second and R. Armstrong was third.

As to the women's championship, the Russians won all the prizes. Svetlana Kapanina became the four-times world champion, performing on the modernised Su-26M3. The second place was occupied by Elena Klimovich, while Svetlana Fedorenko ranked third.

A total of 52 aircraft participated in the championship, 25 of which were designed by the Sukhoi Design Bureau (Su-26M, Su-26M3, Su-29 and Su-31 aircraft). They were piloted not only by Russian but also by many foreign participants, proving beyond doubt that Sukhoi aerobatic planes are in demand abroad. For more information on the upgraded Su-26M3, that contributed greatly to the success of the Russian team, see an article in this issue.

Contracts

Russia and Malaysia sign contract on 18 Su-30MKM fighters

On 5 August 2003 Russian President Vladimir Putin and Prime Minister of Malaysia Datuk Seri Dr Mahathir Mohamad signed in Kuala Lumpur the contract to deliver 18 Su-30MKM twin-seat miltirole fighters to the Royal Malaysian Air Force. The two nations' defence ministers, Sergei Ivanov and Datuk Seri Najib Tun Razak, signed the $900 mln contract on 19 May, but the document needed signatures of the respective heads of state to come into effect.

Under the contract, Irkut Corporation will build 18 Su-30MKM warplanes and deliver them to Malaysia; the first six-ship batch will be delivered in June 2006, with six more aircraft scheduled for delivery in late 2006 and the remaining six in 2007. The contract payment will be conducted by 2009. The customised onboard equipment will be built around Russian- and foreign-made (and possibly Malaysian) systems.

The heads of state agreed on further development of aerospace cooperation, including deployment of a Malaysian servicing center for Su-30MKMs, joint development of an aircraft simulator, etc. The parties also reached an agreement on including the first Malaysian astronaut into the 2005 ISS crew to be delivered to orbit on a Russian Soyus spacecraft.

Czech Air Force gets Rostvertol choppers as debt repayment

In mid-June, Rostvertol sent a second batch of Mi-35 helicopters to the Czech Republic as a repayment of the Russian national debt. The first three Rostvertol-built Mi-35s joined the Czech Air Force in January 2003. Under the contract Rosoboronexport, a state intermediary, is to deliver a total of seven helicopters.

The idea of getting Russian Mi-35s for the national air force belongs to Czech Defence Minister Yaroslav Tvrdik. According to the CFE Treaty, the Czech Republic can operate as many as 50 aircraft of the kind, while it had a mere 20 Mi-24 gunships in service. In late 2001 during Russian Prime-Minister Mikhail Kasyanov's visit to Prague, an agreement was reached to deliver new Russian helicopters and modernise in-service ones.

At the same time, Rostvertol offered Mi-35 modernisation out of the debt repayment contract. At the customer's requirement Mi-35s can be equipped with composite rotor-blades to be used on the new generation Mi-28N helicopter once tested on the Mi-35M.

Winglets buys four Yak-54s

During the Paris air show at Le Bourget the Russian delegation signed only one contract - on the sale of four Yak-54 aerobatic aircraft. The buyer, French Winglets, ran an extensive marketing research and got into details of all aircraft offered. It finally chose Yak-54 developed by the Yakovlev Design Bureau and manufactured by the Saratov-based aircraft plant. The aircraft was recently certified as compliant with airworthiness requirements, with the type certificate issued on 22 November 2002. earlier, several Yak-54s are exported to the USA.

Of special interest is the programme, for which the aircraft are bought. The French are making the world's first women's aerobatics team to take part in various competitions and air shows. The French liked the aircraft very much. The head coach of the French aerobatics team was quoted as saying "the Yakovlev aircraft have the best reputation in France."

Mademoiselle Claude, a leading pilot in the team, pointed out the "beauty of plane's contours", saying that "the cockpit is superb in terms of ergonomics" and that "it feels comfortable there."

Ukraine to deliver four An-32P firefighters to Libya

Aviant plant (Kiev) has signed a contract with Libya over delivering four An-32P firefighting aircraft to that country. The An-32P is designed for fire extinguishing operations over forests and other hard-to-access areas; it can carry up to eight tonnes of extinguishant in external spray tanks. The aircraft is fitted with special equipment facilitating approach to a fire site. The An-32P can also be used to airdrop 27 firefighters and special firefighting assets.

Aviation authority to buy M-101T for training

The Russian State Civil Aviation Service is considering a possibility of buying 16 M-101T Sokol light multi-purpose turboprop aircraft (earlier known as Gzhel) for its training centres in 2004. The aircraft are produced by the Sokol plant in Nizhny Novgorod. When negotiations are over, ten aircraft will go to Ulyanovsk and another six to Buguruslan.

Sukhoi to service Algerian Su-24MK bombers

In 2003-2004 Sukhoi company will deliver equipment required for maintenance of Su-24MK tactical bombers now in service with the Algerian Air Force. The complete set includes spare parts, training, auxiliary and other equipment.

In 1988-1989 the Algerian Air Force purchased 10 Su-24MK aircraft from the Soviet Union. In 2002, Algiers signed a contract with Rosoboronexport on delivery of another 22 Su-24MK tactical bombers.

Atlant-Soyuz gets An-124s

On 15 August 2003 the first An-124-100 of the Kiev-based Aviant plant will be handed over to the Russian Atlant-Soyuz air carrier. The maiden flight is scheduled for 10 August.

Atlant-Soyuz will be a third Russian air carrier operating An-124-100. As of today, the Russian Volga-Dnepr and Polyot companies have nine and three such aircraft respectively. Another seven aircraft are in service with Ukrainian Antonov Airlines.

Atlant-Soyuz was founded in 1993. It is in the top five of Russian cargo transportation companies, boasting a fleet of 14 Il-76s, one Il-96-3000 and two Il-86s.

Apart from the Kiev-built Ruslan, Atlant-Soyuz intends to lease five more aircraft of this type from the reserve fleet of the Air Force's Military Transport Aviation. Prior to leasing the An-124s will undergo overhaul reconditioning at the Ulyanovsk-based Aviastar plant, and will be upgraded to the An-124-100 standard. All the five machines will remain in the Air Force reserve fleet, and will be returned to the owner at short notice.

Air Libya to operate An-140

On 20 June, the Kharkov State Aircraft Manufacturing Company signed a $45 million contract with Air Libya on delivery of five An-140s. Under the contract, KSAMC is also to provide maintenance and train specialists.

The Air Libya private air carrier was founded in 1992. Today it operates in Libya, flies to Sudan, UAE, Chad, and is employed by Golf Oil Co. and Egypt Oil Co. It offers transportation services to businessmen in Germany, Spain, Italy, and other European counties. The company boasts a fleet of nine Yak-40, four An-24, An-26, and Tu-134B-3 and 12 Cessnas, which are operated in Northern Africa.

Cosmonautics

Aerospace system prospects

The recent on-site session of the Russian Aerospace Agency's scientific and technical board, which took place at the Central Aerohydrodynamic Institute (TsAGI), was dedicated to prospects of aerospace systems. Reports were delivered by specialists of TsAGI, Myasishchev Experimental Machine-building Plant, MiG Russian Aircraft Corporation, Ilyushin, Tupolev, Molniya Scientific Production Association, Air Launch Corporation, etc. The speakers highlighted the advantages of aerospace systems based on M-55, MiG-31, Il-76, Tu-22M3, Tu-160, An-124 and An-225 aircraft over vertical-firing launch vehicles. Launches performed with the use of aerospace systems can cut the cost of inserting one kilogram of payload by one hundred times. For the majority of aerospace systems, the cost of launching a kilogram of payload falls between $2,500 and 10,000, and may reach as high as $200,000 per kilo for separate types of payload.

The decision was made at the session to charge TsAGI with running comparative analysis of existing aerospace system projects.

NPO PM to run in Vietnam contest

On 18 April 2003, Vietnam Post and Telecommunication Corporation (VNPT) announced an international contest for delivery of VINASAST, the first Vietnamese communications satellite. The Reshetnyov Science and Production Association of Applied Mechanics (NPO PM) has received an official request for proposal, containing a voluminous packet of contractual documents for development and delivery of a turnkey satellite and associated ground control system.

The customer's primary requirement of each contester will be provision of a solution for frequency coordination of the longitude 132 orbital position, which the satellite is planned to assume. This point in orbit is largely used by Japanese, Indonesian, Chinese and Tonga satellite networks, so VINASAT's operations should be so coordinate as to not hamper operation of neighbouring spacecraft.

Apart from NPO PM, eight companies are invited to run in the contest: Space System Loral, Lockheed Martin and Astrium.

The work on the contract is to be started in October 2003. A VNPT representative stated on 1 July that the first Vietnamese satellite would be launched in 2005. There is a good chance that the vehicle will be built in Russia, and that Russian specialists will train Vietnamese personnel in handling the satellite.

Russia accomplishes space launch programme

Russian space agencies have executed the entire space launch programme for the first half of 2003. Four launches were performed from the Plesetsk space centre, another six from the Baikonur space centre. All the space vehicles were inserted in designated orbits. There will be no launches in July.

Russia and ESA to develop new launch vehicle

Russia and the European Space Agency (ESA) will develop a new launch vehicle for operations from the Kourou launch site in French Guiana. Developing new launch vehicles is a strategic mission of cooperation between the Russian and European space agencies. New vehicles are likely to mount environment-friendly methane engines developed by the Energomash Scientific Industrial Association. Preliminary negotiations with the Russian party are already underway.

Until the new launch vehicle is around, Russian Soyuz booster rockets will be used for liftoffs from Guiana. The first Soyuz-Kourou launch is scheduled for 2006. Construction of a launch pad for Soyuz vehicles will begin in late 2003. ESA has earmarked 314 mln euros for the project, which will enable the partners to secure a significant portion of the space services market despite stern competition.

Yuzhmash launches microsatellite produciton

State Enterprise "Production Association Southern Machine-Building Plant named after A.M. Makarov" (Yuzhmash) has launched production of new generation satellites, so-called Mikrosputnik Class open-frame spacecraft designed for real-time monitoring and remote Earth sensing system. The 2003-2007 National Space Programme lists development of such spacecraft among the priorities. Lightweight, small-size microsatellites do not yield to traditional space vehicles in performance. The new class of space vehicles will be capable of carrying out a variety of tasks, while simultaneously addressing the vital problem of payload weight.

Yamal-200 launch postponed

The launch of two Yamal-200 communications satellites, originally scheduled for August 2003, has been postponed until autumn due to manufacture delays at the Korolev Energia Rocket and Space Corporation. The delays were caused by increased workload involving the manufacture of space vehicles for the International Space Station. Apart from their direct communications function, the Yamal-200 satellites are designed for a range of scientific experiments. The satellites are planned to be inserted by the Proton-K Series 407-02 launch vehicle fitted with the 11S861-01 booster.

Russia to renew communications satellite constellation

The constellation of Russian communications satellites is to be renovated by one-half by 2005. Part of the 20+ satellites currently in operation belong to the Russian Ministry for Communications and Informatisation, others mainly perform specific missions. The 2003 and 2004 plans include insertion of Series Express, Yamal, Ekran, Gorizont and Gonets satellites in orbit. All launches will be performed from the Baikonur and Plesetsk Space Centres. Services provided by the constellation to Russia and CIS states include digital data transmission (including Internet connection), telephony, TV relay services and videoconfenrencing. Foreign providers currently account for 32 per cent of this market in the CIS countries; this figure is expected to drop to 10 per cent by 2005.

New engine pleases designers

The improved RD-108 liquid propellant engine was tested at a Samara testing ground on 5 July 2003. The engine's increased thrust will boost the allowed payload weight by 1.5t. The modernised RD-108 will be installed in Soyuz-2 launch vehicles that Russia will start using in 2006 for commercial launches from the Kourou launch site in French Guiana.

Aerospace news from Russia & CIS were prepared by Andrei Fomin, Andrei Yurgenson and Piotr Butowski. The following sources were used: ITAR-TASS, Interfax and RIA-Novosti news agencies reports, as well as Internet sites: www.lenta.ru, www.gazeta.ru, www.finmarket.ru, www.rian.ru, www.strana.ru, www.regions.ru, www.rbc.ru, www.newsru.com, www.finiz.ru, www.gzt.ru, www.1tv.ru, www.cosmoworld.ru.

REBIRTHING FOR LONG-RANGE BOMBERS

As Colonel General Vladimir Mikhailov, Russian Air Force Commander-in-Chief, noted at a press conference held on the eve of the Air Force Day, no new types of long-range bombers are expected to enter service in the near future. He explained this by the fact that a major part of bomber fleet operated by the 37th Air Army is still relatively young, and will remain in service for another 40 or 50 years. There is nothing contradicting to international practice in this. General Mikhailov reminded journalists that the oldest of Tu-160 strategic bombers currently operated by the Russian Air Force was built in 1986, and a new aircraft of this type will be built this year at Kazan Aircraft Production Association. Most of the Tu-95MS strategic bombers and Tu-22M3 long-range bombers in service with the Air Force were also built not more than 15-20 years ago, and still have a sizeable remaining life.

Repair of the Tu-22M3 long-range bomber at the 360th ARP. Top: Tu-95MS "Tambov" is ready for take-off

In this situation, the commander-in-chief believes, a much more expedient option would be to extend service life of in-service Tu-160s, Tu-95MSs and Tu-22M3s through timely repair, and also enhance their combat efficiency by upgrading onboard equipment and introducing new weapon systems. This work has already been started. For example, Tu-160 and Tu-95MS strategic bombers will shortly get a new long-range missile, which has by now almost accomplished the testing programme. These types of aircraft will also be fitted with guided and free-fall ordnance.

Air Fleet correspondents have recently visited the 360th Aircraft Repair Plant near Ryazan, which repairs the majority of long-range bombers. We would like to thank General Mikhail Oparin, former Long-Range Aviation Commander and currently a Tupolev employee, for having organised the visit.

The 360th Aircraft Repair Plant is coming up 70. It was founded on 25 April 1940 as the 287th Aircraft Repair Base. In 1958 the base was relocated to the Dyagilevo railway station near Ryazan, and engaged in repair of Tupolev-built bombers.

Tu-16s in 1959 became the first aircraft type to go in for repair: specialists temporarily worked on bombers on an open apron of the Dyagilev Flight Centre while shops were being erected and equipment installed. At first the aircraft aggregate, equipment and weapon repair shops were housed in railway cars and barracks. The first repaired Tu-16 was flight-tested in 1960, and on 3 May 1962 the base was reorganised into the 360th Aircraft Repair Plant.

In 1969 the plant set out to repair Tu-22 supersonic bombers. Two years later, repair of the first three Tu-22s was accomplished. In the late 1970s plant specialists repaired wing bear-loading fittings of 17 Tu-22P ECM aircraft and upgraded the airplanes by considerably extending their combat capacities. Efforts to repair Tu-22s operated by foreign customers merits a special mention: the aircraft that were sent in for repair had extensive wing panel corrosion due to climatic peculiarities of their operation. None of the standard technology processes existing at the time provided for elimination of such defects, but the plant coped with the task. This was followed by modernisation of Tu-22R reconnaissance aircraft, repair of a 3M-T Atlant and many other nontrivial assignments.

In 1984 the plant launched repair of Tu-22M2 bombers, and two years later it began taking Tu-22M3s. After the USSR's collapse the plant switched to repair of Tu-95MS strategic bombers, since the Belaya Tserkov, Ukraine plant that had previously serviced this type of aircraft was no longer under Russia's jurisdiction. The first repaired Tu-95MS took off from the plant's airfield in 1997. Also in 1997 the plant began repairing Il-78 flying tankers and UPAZ external refuelling units. The latter task forded the plant to establish production of all the UPAZ completing parts, including rubber components. Two years later, on 8 July 1999, the first tanker was repaired. Four days after that the first repaired UPAZ-1 unit was used for in-flight refuelling of a Tu-95MS bomber during a test flight.

Il-78 tankers at Dyagilevo airfield

Successful work to repair Russia's largest aircraft with sophisticated equipment on board is ensured by the plant's extensive capacities, highly qualified personnel and excellent organisation. The plant's shops are as orderly and clean as an operation room.

Long-range aircraft are currently Russia's only assets capable of non-nuclear deterrence. Versatility and high mobility render long-range aviation a powerful argument in securing national interests. One example of this was the Zapad 99 command exercise, during which two Tu-160s approached Norway and two Tu-95MSs flew to the coasts of Iceland. Long-range aviation further proved its combat readiness in May 2003, when two Tu-95MSs launched cruise missiles in the Indian Ocean. However, preserving and retaining combat capabilities of contemporary aviation is impossible without timely modernisation and repair. And this is exactly what the 360th Aircraft Repair Plant offers.

Andrey YURGENSON

Tu-22M3 take-offs for another flight

AIR SWORD OF RUSSIAN FLEET

The naval air arm of the Russian Navy marked its 87th anniversary on 17 July 2003. The eve of the event saw a large-scale Navy exercise held in spring and early summer that was joined by a variety of forces including the naval air arm. Participating in the exercise were all the fleets of the Russian Navy. The exercise proved high combat readiness of naval aviation that comprises long-range ASW aircraft, missile-carrying and attack aircraft, shore- and ship-based fighters and ASW helicopters.

Establishment of the Russian Naval Aviation Pilots Training and Conversion Centre in the town of Ostrov, Pskov Region, had a positive impact on the quality of training naval aviation crews received. Modern facilities and up-to-date simulators have brought with them new possibilities where training of pilots and maintenance personnel is concerned. Recently, the Centre was provided with L-39 trainers, which reduced the overall cost of training. The Centre pursues a selective approach to training with each and every pilot receiving the kind of training he needs, given the skills he has. For instance, an experimental switch from handling the L-39 trainer to piloting the Su-24 bomber, upon logging the required number of flight hours, though, is now being conducted.

The exercise showed such an approach was right, for all missile launches and target intercepts got good and excellent marks.

Another positive step in making training more intensive consists in better supply of fuel and lubricants to naval aviation units with the amount of fuel allocated this year being 28% more than in 2002.

The Ostrov-based training centre is the only place in the Russian Air Force equipped with the latest Su-33 simulator. Fitted with a sophisticated situation and flight path display system, the simulator allows for efficient accomplishment of the flight task, reduce expenses and extend life of aircraft.

Ageing of flight personnel and a drop in the number of first and second class pilots is a big problem. To date as many as 90 young pilots have been selected for extensive training and maintaining their piloting skills, which will improve the traditions of continuity.

It is due to well-organised and painstaking work of maintenance personnel that about 60% of aircraft in service with the Russian Navy are combat-ready. Compared with the situation in the near past, this is a big step forward. Some aircraft are mothballed, which calls for certain expenses and efforts, too.

Naval aviation command spares no effort to facilitate logistics support and improve the con-

Pilots of the 43rd separate attack squadron of the Black Sea Fleet naval aviation stationed at Gvargeyskoye airfield in Crimea

Su-24M strike aircraft of the 4th separate Guards naval attack regiment of the Baltic Fleet at their base, Chernyahkovsk airfield

dition of aerodromes and infrastructure. Having handed over several aerodromes to the Russian Ministry of Transportation, the Navy rid itself of the necessity to maintain and operate them, thus saving considerable assets. Money allocated allows for repair of one aerodrome per fleet.

Since the state budget has no provisions for acquisition of new aircraft in the near future, the naval aviation command places emphasis on modernisation of in-service machines, arming them with up-to-date weapons and equipping with advanced on-board systems. For instance, Su-33 ship-based fighters are being upgraded as part of the scheduled repair effort, Ka-27 helicopters are being fitted with improved optronic systems, while Il-38 baseline ASW aircraft are being modernised as well.

Naval aviation units continue their intensive combat training. The 43rd separate attack squadron of naval aviation of the Black Sea Fleet headed by Colonel Vasily Fisenko shows good results in combat training continuing glorious traditions of the 43rd fighter regiment tailored as far back as 1938.

On 11 May 2003, the Black Sea Fleet marked the 65th anniversary of the regiment at the Gvardeyskoye airfield in the Crimea, inviting the veterans of the heroic unit. During WWII fighters of the regiment, LaGG-3 and Yak-9T, sported an emblem that made the enemy tremble with fear - a wing ending with a fist holding a sword. Operating Su-24 bombers and Su-24MR reconnaissance aircraft, the unit is a real power in the area of the Black Sea.

Pilots of the Baltic Fleet performed just as well. Aircraft of the 4th separate Guards naval aviation attack regiment headed by Colonel Valery Zorin provided support for the naval task force engaging surface targets.

From 1988 till 2002, the regiment was remained unbeatable among attack units of the naval air arm where bombing skills were concerned. In 2002 the regiment was chosen among the units of the Baltic Fleet to be awarded the cup prize of the Kaliningrad Region governor.

Pilots of the 279th separate ship-based fighter regiment of the Northern Fleet, operating Su-33 fighters and Su-25UTG trainers, keep on training, too. In August-September this year the regiment is expected to resume flights from the Admiral Kuznetsov heavy aircraft carrier that has undergone a two-year overhaul at a dockyard near Murmansk.

Carrier-borne aircraft of the Russian Navy's Northern Fleet on display at IMDS 2003, Pushkin airfield: Su-33 fighter and Su-25UTG trainer of the 279th separate carrier-borne fighter regiment, Ka-27 ASW and Ka-27PS SAR helicopters

Su-27 fighter of the 689th Guards fighter regiment of the Baltic Fleet naval aviation now located at Chkalovsk airfield

Su-33 and Su-25UTG aircraft as well as Ka-27 and Ka-27PS helicopters attracted many participants and guests of the IMDS 2003 international maritime defence show held in St. Petersburg in late June. An important event of the show was the opening speech of the Navy First Deputy Commander Admiral Kravchenko to the effect that under the approved armament program the naval aviation will start receiving new aircraft in 2010. Exactly at that time construction of combatant ships, including aircraft carrier class ones, will commence.

Viktor DRUSHLYAKOV
Photos by author

RESCUE COMES FROM ON HIGH

Military aviation and space exploration come hand in hand with great risks. To err is human, and there is always the possibility of technical malfunction. Every annual flight safety sheet on Russia's military aviation contains reports on varied flight accidents. The crew and passengers survive in most cases, and this is largely due to operation of the Federal Aerospace Rescue-and-Recovery Department (FPSU) attached to the Russian Defence Ministry.

The FPSU falls into two divisions, one engaged in rescue-and-recovery support of aviation operations and parachuting training, the other in charge of rescue-and-recovery support to space flights. There is also the Main Search-and-Rescue Coordination Centre (GKTsPS), whose mission it is to coordinate efforts of ground and airborne rescue forces.

Major General Vladimir Popov, FPSU chair, kindly agreed to give Air Fleet an interview.

How long has the FPSU been around, and how has the air rescue-and-recovery service been developing in Russia?

The history of air rescue and recovery in Russia dates back to before the 1917 Revolution, when it was directly linked to arctic exploration activities. In 1914, First Lieutenant of the Admiralty Yan Nagursky took off from Novaya Zemlya to search for the Sedov, Brusilov and Rusanov expeditions.

In 1928, polar pilot Boris Chukhnovsky found seven survivors of the Nobile expedition, whose Italia zeppelin had crashed.

In 1934, pilots Mikhail Vodopianov, Ivan Doronin, Nikolai Kamanin, Sigizmund Levanevsky, Anatoly Lapidevsky, Vasily Molokov and Mavriky Slepnyov were the first in the Soviet Union to get the Hero of the Soviet Union title, for courage and heroism during the operation to rescue and evacuate the passengers and crew of the Semyon Chelyuskin steamer.

During WWII various supernumerary search-and-rescue groups rescued over 16,000 aircrew members and many crews of sunken ships.

The advent of space exploration highlighted the necessity of providing for safe reentry vehi-

Bio

Vladimir Popov was born in the town of Mariinsk, the Kemerovo Region, on 13 September 1951. He graduated from Barnaul Higher Military Aviation School for Pilots in 1974 and from the Gagarin Air Force Academy in 1982. Mr Popov's 1974-1988 Air Force career included positions from pilot to bomber regiment commander. In 1988 he began service at the Interdepartmental Commission for Air Traffic Control (ES UVD). After his 1993 graduation from the General Staff Academy Mr Popov was appointed chief of staff/senior assistant aviation commander-in-chief of the Russian Federal Border Guard Service. In 1997 he was appointed assistant chair of the FPSU, followed by the 1999 promotion as member of the Central Pilot Qualification Commission for aviation of the Russian Interior Ministry). In 2002 he was once again appointed assistant chair, and in March 2003 chair of the FPSU. Major General, Honoured Military Pilot of the Russian Federation, Mr Popov was awarded the "For Military Merits" order. He can fly 12 types of aircraft and has over 2,000h flight time to his record.

cle landings. The Air Force Commander-in-Chief is charged with this task in his capacity as assistant defence minister. The Air Force Central Command Point was used as the base for a space vehicle rescue-and-recovery wing, but it soon became clear that a special service had to be established for this purpose. Under a resolution by the Council of Ministers, the Air Force rescue-and-recovery service was established in 1966 to provide rescue support to returning cosmonauts and coordinate efforts of military and civil aviation efforts in these operations.

The year 1972 saw the establishment of the Air Force Rescue-and-Recovery Complex and the Centre for Command and Technical Support. The Complex comprised four rescue command points and air rescue-and-recovery units.

Time has proven that reliable rescue-and-recovery support to aerospace operations requires consolidated efforts of all aircraft operators. This was the reason why the Unified State Aviation Rescue-and-Recovery Service (EG APSS) was established in June 1976. After the EGAPSS Department was established in 1977 as a division of the Defence Ministry, the service acquired a government status.

In 1991, the World Air Sports Federation (FAI) awarded a diploma to the Department for outstanding rescue-and-recovery service.

The 1992 presidential decree mandated the creation of the Russian Federal Aerospace Rescue-and-Recovery Service, which in April 1994 was reorganised into the Federal Aerospace Rescue-and-Recovery Department, a state agency attached to the Defence Ministry.

Over its 26-year history the state air rescue-and-recovery service has carried out 3,846 operations to rescue crews o crashed aircraft; 9,791 people, including 5,498 crewmembers, were rescued; rescue aircraft evacuated 287,868 people from crash sites and disaster areas, and transported 289,559 tonnes of cargo.

The service has carried out 1,353 operations to recover reentry vehicles, 95 of them involving manned capsules, and evacuated 219 returned cosmonauts, including 37 foreign astronauts.

What is your department's standing methodology of offering timely help to passengers and crews of crashed aircraft?

Around 135-150 aircraft with rescue officers and specialised equipment on board are daily put on duty in Russia. Today, for example, 144 aircraft are on duty, including 28 fixed-wing aircraft and 116 helicopters. Of the entire number of aircraft, 45 per cent are provided by the Defence Ministry, 43 per cent by the State Civil Aviation Authority and 12 per cent by the Border Guard Service. Russia is a large country, and a single search-and-rescue agency cannot possibly cover its entire territory. This is why we have assistance from all federal agencies that operate aircraft. The Main Rescue-and-Recovery Coordination Centre takes stock of all aircraft currently on duty, to know the aircraft nearest to the crash site. If necessary, additional rescue forces are sent in.

The press in late May reported the planning of an international search-and-rescue exercise. What objectives will that exercise pursue?

In September 2003 we will hold the SAREX MKS 2003 international exercise involving Russian, US and Canadian search-and-rescue officers. The exercise will be held on the Black Sea, near the town of Gelendzhik. Its primary objective will be rehearsal of interaction between air rescue-and-recovery teams in searching for, evacuating and providing medical assistance to the International Space Station crew in case of their emergency alighting on water. The US and Canadian search-and-rescue services have been invited to each send 20 specialists to the exercise. The exercise will involve fixed-wing aircraft, helicopters, ships, specialised search-and-rescue vehicles of the Black Sea Fleet and the Air Force search-and-rescue complex. A Be-200 amphibious aircraft may be involved sometime in the course of the exercise.

This is not the first such exercise, is it?

It is the tenth, the first one was held on Stolovy Island (Novosibirskie Islands Archipelago) in 1993, and involved air rescue-and-recovery teams from Russia and the US. The exercise was aimed at rehearsing interaction between international air search-and-rescue forces in rescuing people in distress in remote arctic areas. In 1994, the Arctic SAREX 1994 exercise was held in Alaska, and involved Canadian specialists apart from Russians and Americans. Since then such exercises have been held every year in one of the three participating countries, save for 1999 when there was no exercise. As the ISS was beginning to take shape in orbit (it was initially planned to go by the name Alfa), we suggested staging the SAREX Alfa 2000

exercise. That one was held in the Leningrad Region under the command of Colonel General V.S. Bobryshev, commander of the Leningrad Military District. The exercise pursued the objective of rehearsing joint assistance to the ISS crew in case of a hypothetical emergency landing. The difference between that exercise and the 2003 event is that in the former case specialists rehearsed operations in an inland water body. This year's exercise will be staged in the actual emergency space landing area.

From Arctic SAREX 1993 to Arctic SAREX 1996, each participating party used its own forces and aircraft in the exercise. That was the phase of studying each other's tactics, so to speak. Starting from Arctic SAREX 1997, which was held in Kachemak Bay, Alaska, the parties decided on inserting invited specialists into search-and-rescue units of the hosting country. This provides an insider's view of the partner country's methods and simultaneously helps rehearse interaction within an international search-and-rescue team.

The series of exercises helped our countries' search-and-rescue teams interact in various non-standard situations and understand each other. Most importantly, they opened ground for the Arctic Search and Rescue Agreement, which is currently being considered by the US, Canadian and Russian governments.

Could you speak of your relations with the CIS states?

We are on especially friendly terms with Kazakhstan, since the Baikonur space center and space vehicle return area are located in that country. A contingent of Russian troops is stationed in Tajikistan, and we provide search-and-rescue services there as well. In December 1994 the prime ministers of Russia, Ukraine, Azerbaijan, Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Uzbekistan and Turkmenistan signed the agreement on cooperation in organising search-and-rescue support for civil aircraft operations. The November 2002 resolution by the CIS Council of Ministers adopted the provisions on organising interaction of Army air rescue-and-recovery services of the CIS member states.

Does your department provide rescue support to people that find themselves in distress during the counterterrorist operation in North Caucasus?

This is one of our primary missions. A duty force deployed in the area of the counterterrorist operation is on permanent alert for distress signals. The force employs aircraft of the Army, Ministry of the Interior, Border Guard Service, and, if necessary, armoured vehicles. The Department organises interaction, unification and coordination of efforts of all structures that engage in air search-and-rescue operations. Just like in peacetime, a search-and-rescue operation in North Caucasus is only referred to as accomplished after rescue teams have either located and evacuated the survivors or found them dead.

Here is one example of this work: on 20 March 2003 contact was lost with two helicopters. Bad weather in the mountains forced us to deploy both airborne and ground search-and-rescue units. Once the crash site had been located, specially trained mountaineers were sent in to evacuate the bodies and recover the onboard flight recorders. During the operation our aircraft spent the aggregate of 177h in the air.

Could you please tell our readers about your activities to rescue space crews?

The concept of rescue-and-recovery support to space operations implies the idea that the necessary number of rescue forces should be concentrated in the planned landing zone, and that a backup force should be ready to step in case of contingency. We use fixed-wing aircraft, helicopters and specialised cross-country vehicles to locate and evacuate landed space vehicles.

FPSU officers take part in pre-flight space crew training organised by the Gagarin Cosmonaut Training Centre; our officers train cosmonauts in special parachuting techniques and survival in various climates, organise special training of personnel that take part in rescue-and-recovery operations, and inspect their level of training.

Long before the lift-off the Department identifies the rescue forces required; four days prior to launch these forces assume their positions along the insertion track. The auxiliary command point starts operation at the space centre. By the lift-off time, 22 helicopters and 15 fixed-wing aircraft are positioned along the insertion track (each of them ready to take off ten to 20 minutes after corresponding orders are issued), and several helicopters ready for immediate takeoff are deployed at the space centre. The FPSU's task in this light phase is to calculate, jointly with the flight control centre, the possible landing zone for the re-entry vehicle, order immediate takeoff of rescue aircraft in the respective area and direct them to the landing zone.

The 4 May re-entry of the Russo-American ISS crew made a lot of headlines. What is your appraisal of your subordinates' performance in that particular case?

As the chief officer in charge of rescue-and-recovery support to space operations I was at the time on my way to the planned landing zone. Our ELINT teams normally acquire the re-entry capsule while it is still in the air, after the parachute system is deployed. This time, our An-12 airborne ELINT crew heard the cosmonauts report correct parachute system deployment. But the signals from the capsule's radio buoys were getting weaker, too weak for our ELINT equipment to detect the cosmonauts' heading, and then died away completely. We raked the planned landing zone but found no capsule. The two possible explanations were an overshoot or an undershot. Now that the cosmonauts had said they were fine, we reasoned, they must have re-entered along a depressed trajectory, i.e. overshot the planned landing zone. Still, we decided to send part of rescue crews along the ballistic re-entry trajectory, while the remaining crews were ordered to return to base for refuelling and await orders to search along the overshoot trajectory. We found the capsule eventually, 455km short of the planned landing zone. The cosmonauts had had no time to report a ballistic trajectory. The rescue parties demonstrated high professionalism in this extraordinary situation. Back in 1979 the Soviet-Bulgarian crew consisting of cosmonauts N.N. Rukavishnikov and G.I. Ivanov had a similar undershot landing.

Thank you for an interesting interview. What would you like to wish all your colleagues?

I wish them as little work as possible, even with our airspace being as densely inhabited as it is.

Pavel IVANOV

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MI-38

PREPARING FOR TAKE-OFF

The joint programme to develop the Mi-38 twin-engined medium multirole helicopter is one of the largest international undertakings in rotorcraft development, and far better funded than many other such projects. The programme has been put on the list of projects coordinated by the Russo-French intergovernmental commission. The Russian government is vitally interested in the new machine; under the 2002 federal programme to develop civil aircraft for 2002 to 2010 and through to 2015, the project will get 570 mln rubles ($18.5 mln) from the federal budget, with another 7.7 bln rubles ($250 mln) to be drawn from extra-budgetary funds.

Successful implementation of the Mi-38 programme was ensured in December 1992 by an agreement on joint development, production and marketing, signed by the Mil Moscow Helicopter Plant, Kazan Helicopters and Eurocopter. The partners founded Euromil joint-stock company for management, organisation and coordination of efforts throughout the programme. With the shares divided into equal portions between the parties, the agreement was reached that all strategic decisions would only be made by a solid vote. Each shareholder has its commitments to the programme: Mil will be in charge of the general design, component testing and flight testing; Kazan Helicopters will build prototypes, deploy production, organise nation-wide sales and run aftersale support; and Eurocopter will design the avionics suite, flight control components, cockpit and cabin interior, and will be responsible for international certification, overseas sales and servicing. Marketing studies show there is huge international demand for helicopters of this class: the civilian Mi-38 versions alone may count on a market capacity in excess of 300 pieces, which is quite enough for the programme to recoup itself.

The Mi-38 is intended for passenger/cargo transportation, construction and assembly operations, SAR missions; there will also be a medevac and VIP versions. The machine will feature compliance with Russian AP-29, European JAR-29 and US FAR-29 Standards, high reliability and safety, extended component service life, on-condition operation options and high-level crew and passenger comfort. Due to a large-size cargo hold (8.7 x 2.34 x 1.82 m, total volume - 29.5 cu. m.) and significant carrying capacity (up to 6t inside fuselage and 8t underslung) the new helicopter will not only boost the fleet of Mi-8s but also become a good replacement for the heavier Mi-6 and Mi-10 rotorcrafts.

The first Mi-38s will be powered by Pratt & Whitney Canada PW-127T/S gas-turbine engines, but later batches are planned to mount TV7-117 engines developed by the St. Petersburg-based Klimov Plant. Now that the Canadian business has joined the project, international investment covers one half of the entire programme cost, making it exceptionally profitable for Russia.

The situation of the mid-1990s slowed the programme down, forcing the partners to introduce a number of amendments to the Mi-38 development plan. Kazan Helicopters, for one, helped Mil out at one point by taking over several extra liabilities. For example, the first tests on the flying prototype will be held in Kazan, and only then will the helicopter be ferried to Moscow for accomplishment of the flight test programme. The results of Moscow ground tests permit commencement of the flight test phase. As Kazan Helicopters Director General Aleksandr Lavrentyev proudly told on an audience from more than 20 countries at the 23 July 2003 opening of the Sixth Kazan Helicopters Operators Conference, the enterprise has already assembled the first flying prototype. He said, "The prototype is completely assembled, all systems are checked, and we will hand the machine over to the plant's flight test centre by 30 July. We believe that in late August or in September this prototype will take off for its first flight."

It is worth mentioning that alongside with preparing the first Mi-38 for flight tests Kazan Helicopters recently began a construction of the second Mi-38 prototype

Vadim MIKHEYEV

Mi-38 performance	
Max take-off weight, kg	15,600*
Max payload, kg:	
in cargo hold	6,000*
underslung	8,000
Flying speed, km/h:	
maximum	285
cruising	274
Ceiling, m:	
service	5,200
hovering	2,500
Range, km	820-1,350
Passengers	30
Crew	2-3

** Max take-ff weight of the further Mi-38 prototypes will be increased to 18,000 kg in the nearest future while the max payload will exceed 8,000 kg*

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MIKHAIL POGOSYAN: CONSOLIDATING EFFORTS IS OUR PRIMARY TASK

On the eve of the June 2003 Paris Air Show in Le Bourget, Sukhoi Director General Mikhail Pogosyan kindly agreed to be interviewed by editors of Air Fleet. The interview proved so interesting - and so encompassing - that we decided to divide it into two parts. The first part, published in the previous Air Fleet issue, was largely dedicated to the RRJ passenger jet programme, one of Sukhoi's most promising projects. In the following piece Mr Pogosyan tells about Sukhoi's traditional line of activity, which is development of military aircraft.

How do you prioritise in development and production of military equipment?

We currently work along the four major lines here, the first one being modernisation of Su warplanes developed in the 1970s, 80s and 90s. I mean the Su-24M, Su-25 and Su-27 aircraft currently in service with the Russian Air Force, and also Su-30MKs that are exported abroad. The second field of our work is development of a fifth-generation fighter, and the third one covers aftersale support. The fourth line is a deep upgrade of the Su-27/Su-30 family into the Su-32, Su-35 and Su-37 aircraft. These models are to fill the niche between the currently produced Su-30MK and the prospective fifth-generation fighter, which will not hit the market until 2010. There is, therefore, the possibility of second-stage modernisation through upgrading the fourth-generation airframe with elements of fifth-generation technology.

All these four activities are of equal importance to us. Our mission at hand is modernisation of the Su-27 and Su-30MK fighters. The abovementioned second-stage modernisation efforts are our medium-term priority, and the fifth-generation fighter is something we refer to as a long-term project. As for aftersale support, that is our standing priority at all times.

Could you please elaborate on modernisation of third- and fourth-generation warplanes?

As I have already said, we offer modernisation programmes for the entire fleet of Sukhoi aircraft currently in service with the Russian Air Force, including Su-24M front-line bombers, Su-25 attach aircraft and Su-27 fighters. The Su-24M modernisation programme includes replacement of onboard computers, enhancement of navigation precision, a new cockpit indication system and expansion of the guided weapon mix.

The Su-25 modernisation programme is roughly the same: the aircraft will get new cockpit indication and a more precise navigation system. The weapon control system will feature extended capabilities, although we will leave the Klen laser rangefinder as the primary sighting system sensor.

The Su-27 modernisation programme is based on uniform solutions that have already been introduced in the Su-30MK, although the Su-27's single-seat cockpit renders this modernisation variant fairly nontrivial. The programme will enable Su-27 to carry out a variety of air-to-air and air-to-surface missions, including application of guided weapons against ground and sea-surface targets.

We therefore offer modernisation of all Sukhoi-built aircraft types that are currently in service. All our upgrading options are coordinated with the Russian Air Force, and we believe that they are way more efficient than those offered by the competition.

What is the situation with service life extension, repair and spares deliveries for Sukhoi aircraft operated by the Russian Air Force?

This question should be addressed to the Air Force. We do all that is in our powers. The Air Force sees fleet repair and modernisation as its priority, and does everything to enhance combat readiness of its aircraft. These days, warplane modernisation is carried out simultaneously with overhaul. Aircraft thus restored will have extended service lives. As regards service life extension, we have already settled all technical issues. Aircraft operated by the Air Force are in good condition, because they haven't been flown much over the past several years.

Can we say that you have no financial issues with the Air Force as regards service life extension?

No, no issues at all. If we have any questions we always settle things in a peaceful way with our customers. It is our general policy to avoid problems and try to settle any issues as quickly as possible. In my view that our relations with the Air Force, our primary client, are devoid of tension.

What can you say about the export contracts already signed on Sukhoi fighters? To what extent, and how successfully, does Sukhoi provide aftersale support for its products sold abroad?

I believe that you know about the situation here better than I do. We always observe contract deadlines coordinated with our customers. It pleases me to observe that our aircraft are extremely reliable. Analysis of Sukhoi airplanes' operation in foreign countries testifies that we supply well-tested machines, which either have passed or are passing, with customers' consent, the entire test programme. Our customers are content with how reliable the aircraft are. Customer-staged exercises to check combat capabilities of our aircraft also prove their efficiency and correspondence to contractual parameters.

Su-27SM upgraded fighter. RusAF's Su-27 aircraft are now undergoing modernisation to its level

Aftersale support is one of the critical issues, although I wouldn't overestimate its importance. Sukhoi, jointly with Rosoboronexport, currently negotiates with India, China and other customers over deployment of aftersale servicing centres and other aspects of aftersale support. Our position, however, is that successful aftersale support depends not so much on deliveries of spares as it does on provision of comprehensive services to ensure operation of your equipment, predict its behaviour, constantly improve standards, switch to on-condition operation. We have to provide general intellectual and technical support to aircraft operators. This is our primary task, and we are trying to develop aftersale services by way of not merely replacing nuts and bolts but analysing behaviour of structures and systems and offer our customers solutions that would enhance reliability and reduce laboriousness of technical servicing – all within corresponding requirements.

How independent are you in providing aftersale support; where does Rosoboronexport step in?

I think that having several entities provide aftersale support is akin to taking your car apart and hauling separate parts – the engine, electronics, etc. – to different servicing centres for repair. We should have a single agency totally in charge of aftersale support. We believe that the parent company should take charge of this comprehensive mission and bear the responsibility for the entire range of services. We will in no way revise our strategy of cooperating with Rosoboronexport, but our opinion is that the agency should hand the responsibility for aftersale support down to those parent companies

Su-24M tactical bomber is another type of Sukhoi aircraft now in service with RusAF to be upgraded

Su-35 fighter that will become the following stage of upgrade of Flanker-family aircraft

which have obtained licenses to such independent activities. If this is not done, then there will be no progress in this field. Because the current state of affairs, when several service providers engage in rivalry, is abnormal.

Let us now move on to one of the most interesting topics, namely to the fifth-generation fighter programme. What is the current programme status today, what phases are at hand?

We are now developing the conceptual design, something that should be accomplished and submitted to the customer next year. We have already held a series of tenders to pick partners in development of onboard equipment for the fifth-generation fighter; virtually all out current primary partners will join the programme.

What can you say about your contractors in the programme? Who will develop equipment, engines and other parts for the fifth-generation fighter? Who will build the prototypes and launch production?

We have already made up our minds to that effect. We will invite our traditional partners, well-known Russian enterprises: NPO Saturn, Tekhnokompleks, Tikhomirov NIIP Instrument-making Research Institute, Ural Optical and Mechanical Plant, etc. But we consider it necessary to attract other enterprises as well.

The very concept of partner selection was not to pick a single one and then kick the rest out, but rather concentrate universal efforts on the winner's baseline project. Maximum consolidation of efforts is our primary task.

In our capacity as the parent company we try to prevent competition between potential equipment suppliers and consolidate their efforts instead. We believe this approach will help our partners implement their best capabilities, since a separate enterprise cannot fully meet the requirements within the fifth-generation fighter programme. This is why we support cooperation in implementation of this project.

The decision has been made to charge the Komsomolsk-on-Amur Aircraft Production Association (KnAAPO) with prototype construction and production within the programme. The enterprise will certainly be assisted in the prototype manufacture phase by the experimental production facility of the Sukhoi Design Bureau.

Is it possible that foreign partners will be invited to join this programme, or does international cooperation in military programmes belong to the future?

This question definitely belongs to the future, but I should say that international cooperation and participation of foreign partners is a requisite factor for such large-scale project. We will certainly work on it, but I would hate to offer you any definite reply now, while we still have no specific agreements with potential partners. Such agreements take rather long to reach.

This process would never have been initiated if the Defence Ministry had not identified its position on the programme, if we had not held the tender to select Russian participants. Nobody would have seriously discussed the terms of partnership with us if we had not developed an ideology for such projects. The Defence Ministry and industry have worked out one. This ideology, approved by the government, forms the basis for further progress in development of international cooperation.

The Defence Ministry is aware of how crucial international cooperation is, and has already officially okayed participation of foreign partners in the programme. It is in fact the first time we are inviting foreign businesses to cooperation in development of a new warplane. In general, this project features a number of pioneering approaches, both in technology and programme organisation.

Let us now speak about modernised aircraft that will fill in the niche between the current Su-30MK and the prospective fighter. What will be the principal difference between the future Su-35s and Su-37s and the current Su-30MKs? Will these upgraded aircraft enter service with the Russian Air Force?

Su-30MKI supermanoeuvrable fighter is a today's offer of Flanker 4+ generation aircraft for foreign customers

Su-32 multirole frontline aircraft now undergoing official tests will be put into inventory with the Russian Air Force soon

We expect to focus major customer resources on the current modernisation phase, and also on development of the fifth-generation fighter. But we believe that a second phase of Su-27 family modernisation may well be run on the Su-32, Su-35 and Su-37 warplanes. These aircraft will differ from the Su-30MK mostly in the capabilities of their avionics and weaponry. We believe that the existing airframe may be used for production of a modernised aircraft with a new radar, improved electronic countermeasures, etc. The aircraft will have a more intelligent equipment suite incorporating our fifth-generation fighter achievements.

The ideology of creating the Su-32, Su-35 and Su-37 aircraft will include introduction of equipment and weapon components to be developed for the fifth-generation fighter programme. These newly developed components will, therefore, enter service even before the fifth-generation programme is accomplished. This will be the principal distinction between the future Su-32, Su-35 and Su-37 and the current Su-30MK. As for airframe modernisation, we will implement a series o measures to reduce the aircraft's signature in various wavebands and extend its service life.

Is Sukhoi intent on expanding the range of exported products? What other Sukhoi-built aircaft, besides Su-27/Su-30MK family fighters and Su-26/Su-29/Su-31 aerobatic airplanes, may enjoy success in the international market?

We are doing our best to come up with competitive civil aircraft. I mean the RRJ project, which we have already discussed in detail. Our long-term plan is to develop a supersonic business jet. There are corresponding technologies to be found in Russia, and Sukhoi has appropriate experience in this field. This, and also the relatively low cost of labour in this country, promises us success if we attract international cooperation. Russia alone cannot implement such a project, nor can any separate foreign country.

What is the status o the programme to create the Sukhoi holding company? How are you progressing? What major integration milestones will you reach this year?

In the third quarter of 2003 we are planning to accomplish integration of the Sukhoi company. By now, 74.5 per cent of shares of Novosibirsk Aircraft Production Association and 74.5 per cent of the Komsomolsk-on-Amur Aircraft Production Association has been moved to the authorised capital stock of AVPK Sukhoi. The remaining portion of shares belongs to the government in the person of the State Property Ministry. AVPK Sukhoi as the management company owns 50 per cent plus one share of the Sukhoi Design Bureau, 38 per cent shares of Beriev and 14.7 per cent shares of Irkut Corporation. This is real integration.

Simultaneously with that AVPK Sukhoi is being reorganised into a 100 per cent state-owned joint-stock company. This transformation means that an elected Board of Directors will be managing the company jointly with the managing board, also to be elected.

The creation of the Sukhoi holding company will conclude the first phase of integration. The second phase will start in 2004, when the company starts acquiring separate enterprises. A number of component suppliers to be acquired have already been identified.

Thank you for the interview. We hope that you will continue telling our audience about your company's activities on a regular basis.

Su-47 Berkut experimental aircraft is used by Sukhoi for developing fifth generation fighter

BE-103 IN AMERICA!

FIRST KNAAPO-BUILT LIGHT AMPHIBIANS SOLD IN THE USA

Perhaps the most prominent aircraft demonstrated at the 29 July - 4 August AirVenture Oshkosh 2003 exhibition, hosted by the US Experimental Aviation Association (EAA), were three Be-103 light multipurpose amphibious aircraft developed by Beriev company and built at the Komsomolsk-on-Amur Aircraft Production Association (KnAAPO). EAA AirVenture is the largest show for light aircraft in the US and the world; this year it gathered around 30,000 aircraft! But the Russian amphibians stood out against thousands of other aircraft, and attracted universal interest at the static display on the local airfield, on a nearby lake and in the air, piloted by KnAAPO test pilot Viktor Guber.

The interest in the Be-103s was further raised by the 31 July ceremony in Oshkosh to award the aircraft with an FAA type certificate in the normal category. This made the Be-103 one of the first Russian aircraft – and the first Russian-built amphibious airplane – certificated to FAR-23. The certificate opened the US market to the Be-103: right there in Oshkosh the first three aircraft were handed over to Sky Manor Airport, turning the Be-103 into the first Russian aircraft sold in the US!

Ceremony of FAR-23 Type certificate handing-over to Be-103 creators at AirVenture 2003 air show at Oshkosh. Top: three Be-103 amphibians are ready for delivery to American customer at the KnAAPO

Department of Transportation

ARCRAFT

Type Certificate

Number A3NX

Be-103 aircraft were delivered to Oshkosh by an An-124 Ruslan heavy freighter

The Be-103 light multipurpose amphibious airplane can be used to transport four or five passengers (with a crew of one or two) or cargoes up to 400kg in weight and up to 3,900mm in length, and can also be used in the business, medical, patrol and other versions. In-field reconfiguration from passenger to cargo/medical version is supported. The Be-103 can operate from concrete/dirt runways and from small rivers and lakes: the boatlike hull and water displacement wing ensures safe water takeoffs and landings at wave height up to 0.5m. The nontrivial design enables the Be-103 to fly virtually everywhere in the world: if there is no airfield – however unprepared – near the destination the aircraft can use a nearby pond as a landing strip.

The avionics suite supports round-the-clock operation in good and adverse weather, and includes a world-standard automatic direction finder, directional heading system, magnetic compass, satellite navigation system, radio navigation and communications system, weather radar and other equipment.

The Be-103 power plant comprises two 210hp Teledyne Continental Motors TCM-IO-360ES4 piston engines mounted on pylons on both sides of the fuselage. The ubiquity of this engine model will additionally simplify Be-103 operation abroad.

Beriev launched the Be-103 project in the early 1990s, and shortly afterwards KnAAPO was selected for construction of all aircraft of this type, starting from the first ground and flight test prototypes. KnAAPO also invested its own funds into the programme.

The first Be-103 prototype took off for its maiden flight from Beriev's ground airfield on 15 July 1997. The second prototype performed the first water-to-water flight on 24 April 1998. Overall, KnAAPO had built seven aircraft by 2001 (one for static trials, one for endurance testing and five flying prototypes).

The Russian certification programme was successfully accomplished by late 2001; on 26 December 2001 the Aircraft Certification Commission of the Interstate Aviation Committee (Aviation Register) awarded the aircraft a type certificate in the normal category. Significant interest in the airplane on the part of potential foreign operators, and also the desire to simplify promotion abroad, prompted Beriev on 8 October 2001 to apply for FAA type certification.

The FAR-23 certification programme was successfully accomplished by the summer of 2003. On 11 July 2003 the FAA Department of Transportation awarded the Be-103 with Type Certificate No A55CE, the one that Nicholas Sabatini, Associate FAA Administrator for Regulation and Certification, later presented to Beriev and KnAAPO representatives in Oshkosh. The AirVenture ceremony followed the May 2003 visit to KnAAPO by an FAA delegation, which had approved the Be-103 production.

KnAAPO launched Be-103 series production in summer 2002, and already one year later the first three aircraft (No 3301, 3302 and 3303) were ready for delivery. KnAAPO test pilot Viktor Guber on 2 July 2003 took the flagship production Be-103 for its first flight from the KnAAPO airfield. All the three machines were tested within a short period of time, and on 23 July an Antonov An-124 Ruslan transport shipped them across the Pacific to Wittman Regional Airport in Oshkosh. All the three Be-103s were then assembled and flight-tested before taking part in the world's largest air show.

The Be-103's US success was largely due to the experience and international reputation of its creators. Beriev remains the only company in the world specialising in development of amphibious aircraft. It has developed the A-40 Albatros patrol/ASW jet, the world's largest amphibian. The first production Be-200 amphibious aircraft, another development by Beriev that enjoys interest of potential Western operators, has recently been delivered to the Russian Ministry of Emergencies.

KnAAPO, which produces the Be-103, is a globally renowned warplane manufacturer. Over its 50-year history of operation in the international market the enterprise has sold abroad more than 2,000 Sukhoi-designed aircraft of the Su-7B, Su-22 and Su-27 families. Su-27SK and Su-30MK fighters produced by KnAAPO are now the primary exportables of Russian aircraft industry, and enjoy universal demand in the international arms market. Apart from producing warplanes and Be-103s KnAAPO is currently preparing for production launch of the Su-80GP multipurpose short-haul passenger/cargo aircraft, which promises to enjoy great demand with Russian and foreign airlines. Also, KnAAPO has developed the Be-103 into the SA-20P light amphibious airplane powered by a single M-14P engine. The aircraft, which currently undergoes a test programme, will be marketed in Russia.

The FAR-23 certificate and the first US deliveries will facilitate promotion of the Be-103 to the international market. Beriev and KnAAPO's American debut has opened a new chapter in the history of Russian aviation, heralding global proliferation of Russian civil aircraft.

Andrei FOMIN

Two Be-103 amphibians at Oshkosh

RUSSIA'S SMALLEST UAVS

The smallest of Russian unmanned aerial vehicles (UAV) are being developed in a private company "Novik 21st Century". The company was founded as early as in 1990 by a group of former employees of NII Kulon institute developing reconnaissance suites for manned and unmanned aircraft. Nikolay Chistyakov, former chief designer of Stroy-P reconnaissance system, up to now one and only tactical reconnaissance UAV system operationally used in Russia, is in charge of "Novik 21st Century". The company is developing two classes of pilotless flying vehicles. The bigger one weights 20 kg, takes-off from a mechanical launcher installed on a cross-country vehicle and flies with a speed of up to 120 km/h during 2-3 hours. In spite of simple vehicle's design, the onboard computer software is very complex and the stabilisation of flight is based on gyrovertical device.

The first variant of this vehicle, Moshkara with 10-Watt transmitter for jamming UHF radio communication of enemy ground forces, began the tests in May 1999. In December 1999, the system was handed-over to the 5th Research Institute of the Russian MoD (5 TsNII MO) dealing with electronic warfare in Voronezh in order to carry out state acceptance tests. In December 2000, Moshkara was handed-over to 924th MTsBPBT center of UAVs combat application in Yegoryevsk for further testing. Presently, the tests of Moshkara are not continued because of lack of financial support from the Russian armed forces.

GrANT or Grazhdanskiy Aerodinamicheskiy Nablyudatel Televizionny is a reconnaissance variant of Moshkara. The work on GrANT got off the ground in June 2000, and in August 2001, the vehicle was for the first time shown during MAKS-2001 in Zhukovsky. The GrANT is used for real time observation at the distance of up to 70 km from the take-off point. The system operates four vehicles simultaneously, but only one of them can actually carry out the reconnaissance when the remaining ones are going to or from target or repeating the approach. The navigation is based on GPS receiver, whereas a gyrovertical device is used for the stabilisation.

The most interesting solution is the method of carrying out the observation (called Chistyakov's Trawl). A heavy movable turret with variable focal length TV camera has been replaced by three light (several dozen grams) TV-cameras fixed at various angles. The operator searching the target watches the terrain by means of the first, wide-angle camera. When approaching the target the operator switches-over the image to the second camera with narrower angle of vision slanted more downwards. In direct proximity of the target, the observation is carried out by the third long-focus lens camera looking vertically. The target's coordinates are recorded by GPS when the GrANT is directly above the target. The TV cameras can be replaced in the GrANT by infrared camera (8-14 micrometer) or infrared scanner, and for other applications – by laser target indicator or radio relay.

"Novik 21st Century" places its biggest hopes on the smallest vehicles: reconnaissance BRAT and electronic warfare Moshkarets, analogues of American FQM-1A Pointer. Keeping vehicle's weight below 4 kg allows its launching from hand without special launching devices. Thanks to their simplicity and price less than $10,000, such vehicles can be used in very big number.

Reconnaissance vehicle BRAT or Blizhny Razvedchik Aerodinamichesky Televizyonny was for the first time shown during High Technologies of Defence Complex exposition at Moscow in April 2003. The BRAT weights 3 kg, its length is 1 m and its wingspan is 1.9 m. It flies with a speed of 80-100 km/h. There are two versions of the vehicle: BRAT-ELLA (Elektrichesky Letatelny Apparat) with an electric motor and BRAT-2 with combustion engine fuelled with methanol; the operational radius of the former vehicle is 5-10 km, and 30 km for the latter one. Against the high-value targets, the BRAT is used as non-return vehicle operating at the distance of 30 km for electric driven variant, or up to 90 km for combustion engine variant. In this case, BRAT indicates the targets for conventional and rocket artillery (the fire range of multiple rocket artillery system Smerch amounts to 70 km). For improving the communication with the vehicle at so great distance, the antenna of ground based control post has been increased.

The BRAT flies to the target according to the programme and transmits to the ground-based control post the TV-image and coordinates from GPS receiver. The flight programme can be changed by the ground-based operator; the operator also switches over the image between two fixed TV-cameras (wide and narrow angle of view). The control post can be portable (in container) or movable (on a truck). The core of the control post is IBM-compatible personal computer, and the biggest-size element of the system is the receiving antenna with diameter from 50 to 200 cm depending on required range.

Electronic warfare UAV system Moshkarets intended for jamming enemy radio communication was shown on 13-16 May 2003 at the defence exhibition in Minsk, Belarus. The jamming operation is performed by a group of small flying vehicles, patrolling within given area and emitting the jamming signals. Moshkarets system consists of the ground control post (installed on truck or in container) and several dozen of AZPP (Aerodinamicheski-Zabrasyvaemy Postanovshchik Pomekh) flying vehicles carrying relays of noise jamming, 1 to 5 Watt of emitting power. The Moshkarets uses the same airframe as the BRAT and electric motor.

Moshkarets system's range is 30 km and endurance of a single AZPP is not less than 60 minutes. The AZPP is launched from a hand and lands in aircraft fashion (during exercises). In combat operations, the vehicle does not come back; it is considered as expandable unit. After being launched, the AZPP automatically receives the flight programme by radio from the control post. According to the programme, the group of AZPP approaches the target area and patrols there emitting the jamming signals. Typically, four through twelve vehicles operate within the target area.

Piotr BUTOWSKI

Top: Moshkarets electronic-jamming UAV launched from hand. Its reconnaissance version is BRAT

GrANT reconnaissance UAV weighs 20 kg and carries 3-kg payload; it is launched from mechanical catapult fitted on a van.

KHARKOV STATE AIRCRAFT MANUFACTURING COMPANY

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has been manufacturing different types of aircraft and proved itself as a reliable partner in aviation world.
Today KSAMC is modern production with high growth potential in regional aviation. We produce aircraft designed to provide the best balance between passenger comfort and aircraft performance, delivering excellent value to the airlines and their passengers.
The new An-148 soon will enlarge successful family of KSAMS aircraft An-74TK-200, An-74TK-300 and An-140.

558th ARP IS OPEN FOR COOPERATION

The 558th Aircraft Repair Plant is headquartered in Baranovichi, Belarus. The enterprise specialises in repair of up-to-date aircraft of the Soviet and Russian origin, currently in service with the national and foreign armed forces.

As of today, the plant is mostly involved in repairs of Su-27 and MiG-29 fighters, Su-25 attack aircraft and Su-17/Su-22 fighter-bombers. Implementing the conversion programme, the aircraft repair plant took up repair of the An-2 that is a well-reputed agricultural aircraft. After undergoing repair at the plant, the aircraft boasts an extended mean time between overhauls, as the enterprise is certified by the manufacturer to carry out such work. At the request of a foreign customer, the plant teamed up with the Sukhoi Attack Aircraft Corp. to upgrade the Su-25UB twin-seater to significantly improve its combat effectiveness. Moreover, the plant offers more and more new services, and toward this end it took up repairing Mi-8 and Mi-24 helicopters in 2003.

The enterprise is manned with skilled personnel and equipped with cutting edge workshop machines to repair airframe, its systems, parts, elements and units of various aircraft. The plant has an abundance of design documentation, and specialised equipment to repair aircraft and manufacture aircraft engines.

In 2002, a quality management system was introduced at the enterprise in compliance with the ISO 9002-94 standard. The system is certified by the national certification body, BelGISS, and the international BVQI Veritas bureau with accreditation from DAR (Germany), COFRAC (France) and ANSI RAB QMS (USA). Moreover, in order to improve the technological and normative discipline at the enterprise, attempts have been made to introduce a quality management system on the bases of the international aerospace standards, IAQS/EN-9100.

Since the success is only possible in case of further improvement of repair quality, the plant is being reequipped, and new technological processes are being introduced. Owing to this, the costs are reduced and the quality is improved. The plant has lately undertaken laser welding and welding with metallic polymers to recover aircraft engines, with four patents obtained. Specialists of the plant have developed an electronic catalogue of the MiG-29 aircraft spare parts and elements. It includes an order form for spare parts and elements, too. Such an approach makes the work with customers much easier, as it rules out any possibility of mistakes and allows fulfilling the orders as quickly as possible. The specialists also made automated working places, so that it takes several minutes to find a faulty element in airborne radars, radio and electronic equipment and other units of aircraft. The cutting edge electronic systems employed allow the specialists of the plant to detect and repair malfunctions in the MiG-29 and Su-27 avionics suites.

The repair cycle results in flight tests of aircraft, conducted by experienced and best-qualified test pilots. After the tests, the aircraft are sent to the customers, usually by transport planes. The airfield in Baranovichi is capable of handling all types of them, including the An-124.

The plant has a training centre right on the premises that includes up-to-date classrooms and a cosy hostel. The enterprise is licensed to carry out foreign economic activity on its own, which allows it to vastly operate in the international market. Currently, it has partners in 15 countries around the globe. Clever marketing and a balanced policy in relations with the customers open wide vistas for the enterprise in the CIS and foreign market.

As to the economic situation at the plant, it is stable and solid. The enterprise employs about 1,700 personnel, being the second large in Baranovichi in terms of payments to the municipal budget.

Air Fleet asked Head of the plant Vladimir Rybin to dwell on the guidelines of the plant.

How come that the list of equipment you repair is constantly growing?

The work in this filed started back in 1992, exactly after the foundation of the republic. It had a lot to do with the fact that the enterprise specialised in repair of only one type of aircraft, and besides, the one that had never been in service with any of the national air force units in the Soviet times, and later with its own Air Force and Air Defence. It is the Su-17 aircraft. Since 1992, the aircraft have been repaired only for foreign customers, namely Russia, Ukraine and some other countries. At the same time, we were incapable of repairing aircraft operated at home.

The President of Belarus Alexander Lukashenko visiting the 558th ARP

Our desire to expand the list of the repaired types of aircraft coincided with the needs of the Air Force and Air Defence. In repairing MiG-29, Su-25 and Su-27 aircraft, which were new for us, we did not request any investment from the Defence Ministry or the government. We spent our own money on purchasing design documentation, equipment and training of personnel. Most of the assistance on the part of the Defence Ministry consisted in giving us free of charge all the equipment, test and measurement instruments and spare parts and elements that weren't used by manoeuvre units and were stored at warehouses. It is owing to this combination of mutual interests that the plant became capable of repairing certain types of aircraft at minimum cost and almost in no time.

The plant undertook repair of helicopters in addition to fixed-wing aircraft. Does it have something to do with the interests of the national Armed Forces, too?

We started doing this first of all in the interests of the Air Force and Air Defence of the republic. At the same time, and I am not trying to conceal this fact, we never stopped short of winning a place in the international market. The shift to the helicopter repair seems a little strange. I do not know any other aircraft repair enterprises that would undertake repair of helicopters in addition to the fixed-wing aircraft. Of course, we are aware of certain risks, but we did it intentionally. The most difficult issue here is that we had never had any ties with helicopter developers and manufacturers from Russia. Nevertheless, I am positive that we will manage the task in set terms. If our Defence Ministry is going to place orders for repairs of the Mi-8T and Mi-24 choppers at the plant in the coming 8-10 months, we will not only say that we can repair such aircraft, but that we can do it at a very fast pace.

What do you think the most promising ways of developing relations between Russian and Belarussian enterprises are?

Today we are doing business with over 300 partners from Russia and the CIS.

Where relations with Russian firms are concerned, we can say that they are far from ordinary ones between industrial enterprises, as they mostly depend on the condition of military and technological cooperation between Russia and Byelorussia as a whole. We must remember that the two countries are building a union; therefore, we have a joint Air Force and Air Defence group that is daily on alert duty. That is why, retaining our traditions in repair of aircraft, we are trying to stick to the classical approach of the Russians in this sphere. We have never considered ourselves to be out of the joint aircraft repair network. Therefore, we can confidently say that our plant can easily be integrated into the repair organisation, beneficial for the two sides. Where the relations with developers and manufacturers in Russia are concerned, we welcome cooperation in the form of joint ventures of different types. As to the relations with the Russian Air Force Directorate for overhaul and maintenance of aircraft and armament, of most importance here is cooperation aimed at fulfilling the joint defence order to keep the aircraft fleet of Russia and Belarus combat ready.

When dealing with repairs of aircraft for other countries, Russian laws in the sphere of military and technological cooperation unfortunately take Belarus as a foreigner. Taking into account the mutual decision to build closer political, economic and financial relations, and our mutual strategic interests, we think that the relations might base on quite a different groundwork.

Our enterprise is eager to cooperate on various joint programmes in the interests of Russia and Belarus.

FED

QUALITY, RELIABILITY, LONGEVITY

State Enterprise Kharkov Machine Building Plant FED, which turned 75 in December 2002, was started as a constellation of small workshops deployed on the premises of Dzerzhinsky Commune, an institute for juvenile offenders. Established and led by outstanding educationalist Anton Makarenko, the workshops started off in 1927 with production of railway ticket punches, oil cans and other metal hardware. Five years later the workshops launched production of primitive electric drilling machines, and January 1934 saw production launch of the well-known FED miniature camera.

During WWII the enterprise, subordinate to the People's Commissariat for Aircraft Industry, was evacuated to the Siberian town of Berdsk. The personnel quickly launched production of fuel pumps for La-5, La-7 and Tu-2 fighters. Since then FED has been producing precision fuel and hydraulic regulation pumps for the aerospace industry. The enterprise's products included TNR-3RA fuel regulator pumps for the Tu-104, the first Soviet passenger jet, NP-26M hydraulic pumps for Su-7, Su-9 and Su-11 fighters, pumping plants for MiG-21s and Tu134s, hydraulic motors for Tu-22 supersonic bombers, etc. In 1966 FED launched production of pumping plants for rocketry applications.

FED Corporation (President V.V. Popov) was established in 1993 on the premises of FED Plant, Kharkov Aggregate Design Bureau (Designer General/Director General V.A. Matusevich), Volchansk Aggregate Plant (President A.A. Antonenko) and Pervomaysky Machine-Building Plant (President L.A. Usov). Today FED Corporation is one of the leading CIS companies specialising in development, production, installation, servicing and repair of aggregates for the aerospace industry and general engineering, with products installed in virtually all Russian- and Ukrainian-made military and civil fixed-wing aircraft and helicopters operated in 60 countries.

Our current development concept envisions dynamic development of technical, economic and intellectual potential of cooperating enterprises based on a single technical strategy to develop and produce competitive hi-tech products. This concept is implemented in the following fields: aerospace products, aircraft repair, specialised products and consumer goods. We ensure successful development through strengthening the existing contacts and merging our in-house knowledge and skill with those of well-known Ukrainian and Russian research centers and enterprises we partner with: Motor Sich, Ivchenko Progress Design Bureau, Antonov, MMPP Salut, Klimov Plant, Ilyushin, Sukhoi, Tupolev, Kamov and Beriev companies, Irkut Corporation, Komsomolsk-on-Amur Aircraft Production Association, Rubin Aviation Corporation, OJSC Star, EGA Scientific Production Enterprise, Kristall Design Bureau, Omsk Engine Design Bureau, Aeroelectromash, Central Aero Engine Institute (TsIAM), State Scientific Research Institute of Civil Aviation (GosNII GA), Scientific Centre of the Ukrainian Air Force and Zhukovsky National Aerospace University.

Our prospects are linked to Russia as the largest producer, exporter and consumer of aerospace produce and specialised equipment.

Simultaneously with promoting relations with partners, we see our top priority in developing Kharkov Aggregate Design Bureau (KhADB), the primary developer of aggregates for FED production facilities. KhADB specialists currently develop advanced aggregates for FED-produced aero engine regulation systems. KhADB has developed, jointly with OJSC Star, a new modification of NR-3VM-T (VMA-T) regulator pumps for TV3-117VM (VMA) engines; an automatic fuel regulation system for the AI-450 engine is undergoing tests. The Design Bureau currently works on new-generation GP-25, GP-26 and GP-31 generator drives, aggregates for gas turbine drives and for electric power plant gas pumping units.

FED Corporation produces integral hydraulic drives, hydraulic motors, hydraulic pumps, fuel regulation equipment, pneumatic and hydraulic aggregates for helicopter, fixed-wing aircraft and rocket control systems, aggregates for hydraulic systems installed in ships, armoured vehicles, rolling stock and gas pumping plants. Apart from direct deliveries and warranty repair FED Corporation offers joint development and production of new articles, technology transfer and personnel training.

FED Corporation has entered the new century with a new programme aimed at comprehensive development, and invites all interested parties to mutually beneficial cooperation.

Alexander ZHDANOV
Director General, FED Corporation

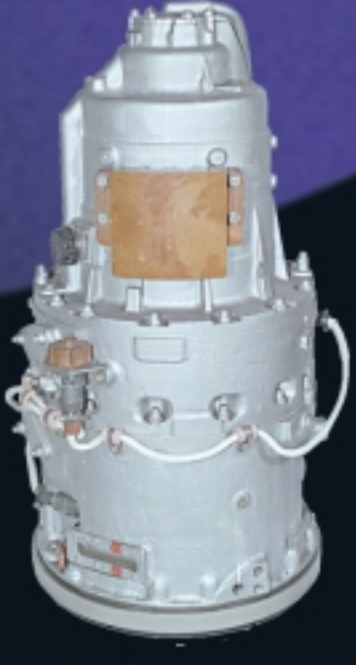
FED CORPORATION

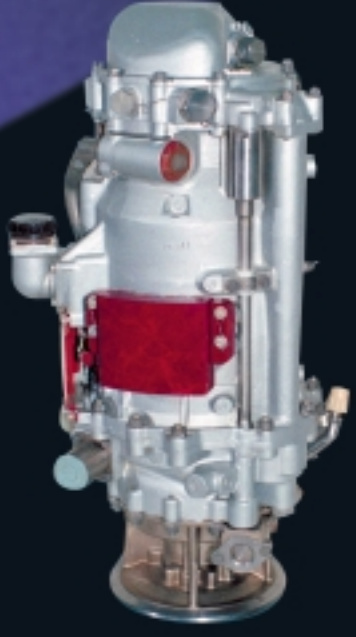
75-years history

More than 60 years on the aircraft systems market

- Integral drives
- Electrically-driven pumping units
- Hydraulic pumps and motors
- Fuel-metering equipment
- Pneumatic units for aerospace control systems

Manufacturing, maintenance, repairs





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OPTRONIC PACKAGE
FOR PANTSYR-S1 MISSILE/GUN AIR DEFENCE SYSTEM

Future surface-to-air missile (SAM) systems of the XXI century will have to meet the requirements to ensure effective protection of military and industrial installations and Armed Forces, as well as make air defence (AD) forces resistant and highly survivable under a massive attack of future aircraft employing precision guided weapons and in ECM environment.

The KBP Instrument Design Bureau is currently developing a system of the kind, namely the short-range Pantsyr-S1. One of its derivatives, the Pantsyr-S1-O, is armed with missiles, guided by the electro-optical control system.

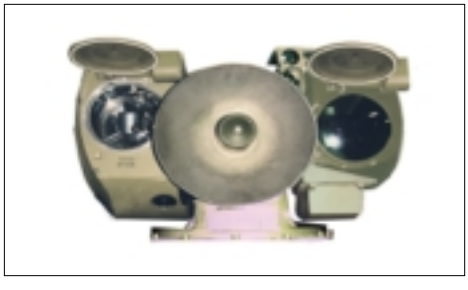
Both the basic version and the derivative are developed following the KBP concept worked out under the supervision of Academician A. Shipunov. The concept provides for:

- equipping a combat vehicle with a set of gun/SAM armament, fitted with a control system that ensures a total kill-zone with missiles and gun from the maximum missile effective range to the minimum gun range (of 200 m). Moreover, it is possible to independently employ either SAMs or the gun.

- employment of a multi-mode integrated radar-optical weapons control system, based on the integrated guidance means. The system ensures high reliability and immunity to jamming, as well as simultaneous attack of a single target and independent attack of two targets in a ± 90-deg sector. The system is capable of tracking and attacking one target using the radar, operating in centimetre and millimetre frequency band, and doing so with the other via the optical sensor package, operating in the infrared frequency band (8-14 micrometer).

- using the "three-point" method of TV guidance that merely requires angular coordinates of the tracked target to attack.

- modular design of the combat vehicle, which allows for variations both in terms of weapons control equipment and armament. For example, the system can be armed with missiles only and equipped with an electro-optical tracking and guidance equipment to become the Pantsyr-S1-O modification.



Under the concept, the Pantsyr-S1-O features the same performance as the basic model, when using electro-optical guidance.

Pantsyr-S1-O is capable of firing on the move, from stationary positions and short halts, killing light-armoured vehicles and enemy personnel by day and night. It has a self-sustained capability, too. The crew and the vital systems of the combat vehicle are bullet and fragment proof. Owing to this the system can be employed in the future AD groupings in the same role as the basic model, i.e.:

- for defence of a large number of small-size and pinpoint targets within the radius of 50-100m to 1.5-3km;

- to ensure survivability of AD groupings by means of direct cover of their main components, including long-range AD systems, command posts, and equipment of EW troops;

- to ensure equal strength of AD groupings by reinforcing them in the situation with small and very small altitudes and in difficult terrain.

The electro-optical tracking and guidance equipment used in this version ensures high immunity to jamming and concealment of the guidance channel, as well as more accurate tracking and guidance, and, finally, more effective engagement of targets as compared to the systems with radar guidance, and lower price of the combat vehicle.

However, since the system is a single-channel one and because the electro-optical system lacks all-weather capability, it is necessary to define its role and evaluate effectiveness of both the system and the attacking aircraft in terms of combat employment for regular missions in all situations.

To this end one can assess the effectiveness of accomplishing missions assigned taking into account meteorological conditions of combat employment of a fire unit or the whole battery in different regions of the country, and in other countries, if exported, as well as evaluate the cost of accomplishing the missions given peculiarities of employment. The latter is defined by the maximum admissible price of the combat vehicle equipped with the optical guidance system.

Where the targets cruising at medium (2-6km) and high (over 6-7km) altitudes are concerned, the more favourable conditions for effective use of electro-optical equipment are available in southern regions of Russia and the CIS, making up 50-65%, while in western regions (Belarus) they amount to 35-50%, and 55-80% in the Mediterranean. Speaking of low-

INSTRUMENT DESIGN BUREAU

KBP

- antitank guided missile systems
- guided weapons for tanks and infantry combat vehicles
- guided projectiles for artillery systems
- gun-missile close-in air defence systems
- multipurpose antitank weapons
- small caliber automatic guns for the Ground Forces, Air Force and Navy
- active protection system
- grenade launchers and flamethrowers
- small arms, hunting and sporting guns

WELCOME TO PARTNERSHIP!

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Primary specifications of the Pantsyr-S1-O combat vehicle	
Armament	missiles
SAMs in container/launch canisters	8
Aircraft detection range (effective reflective surface of 1sq.m), km	25
Aircraft tracking range with TV guidance, km	17-26
Min and max ranges, m:	5-10,000
Min and max altitudes, m:	1,500-18,000
Max target speed, m/s	700
Hit probability:	
aerial targets	0.7-0.98
surface targets	0.5-0.7
Missile type	5736-E
Guidance	radiocommand
Target channels	1
Reaction time, sec	5-7
Crew	3

Composition of the guidance system: target detection radar with semi-active solid-state phased array, IR-sensor of the SAM, commands transmitter, TV tracking device.
Targets: precision guided weapons, cruise missiles, tactical aircraft, helicopters, drones, light-armoured vehicles and small ships.

altitude targets flying at 1,000-1,500m and especially at very low altitudes of less than 1,000m and 100-250m, the screening action of clouds will have almost no effect, while the direct visibility will be in the range from 40-60% to 70-95% depending on the climatic zone. Therefore, when reinforcing AD groupings against low-altitude threats, Pantsyr-S1-O is best suited for realising its capabilities to engage all types of low-flying targets within the whole envelope.

The most favourable conditions for employing electro-optical systems for detection and tracking of all types of aerial targets are in southern regions and offshore water, while those most unfavourable are in northern regions, water areas of the Norwegian Sea and the Barents Sea. Favourability of water areas in the Baltic Sea and the Sea of Japan is somewhere in between.

As to the effectiveness of Pantsyr-S1-O in air defence of a lot of strategic small-size and pinpoint installations, one should not forget that meteorological visibility conditions affect aircraft capabilities, too. That stems from the assumption that in military conflicts of the XXI century ground and sea-surface targets will be mostly engaged by precision guided weapons with a variety of guidance systems, which has been proved by the operations in the Persian Gulf and Yugoslavia.

To counter these weapons, there are plans to ensure automatic detection and designation of missiles to the specified ground, sea-surface, aerial and space targets with pinpoint accuracy using their electro-optical image. Implementation of the idea can be considered a new defence-related breakthrough, comparable in its significance with the Stealth technology.

Homing-in on the target comparing it with the image is going to be achieved through new airborne automatic detection and designation systems. In combat, full of natural clutter and artificial countermeasures, missiles will be able to select the specified targets comparing them with images stored in their memory. Guidance to targets with the help of images will be used in almost all types of weapons, including smart bombs, surface-to-air missiles, and upgraded missiles, where such type of guidance will complement the existing one.

Analysis of available dedicated sources shows what precision guided weapons use this or that type of guidance:

- all-weather guidance systems, self-contained and combined – 35-45%;

- self-contained and combined guidance systems with electro-optical channels or homing heads, requiring good visibility and lack of clouds to ensure maximum combat effectiveness – 55-65%.

Therefore, having some limitations of maximum effectiveness and the extent of mission accomplishment given continuing sophistication of assets and methods of AD penetration, it is advisable to tailor combined batteries, consisting of both basic versions of the fire unit and its electro-optical derivatives. When assessing cost-effectiveness of development and adoption for service of electro-optical systems, it is necessary to keep the price of the battery at the level that does not exceed that of the battery equipped with basic versions, with equal combat capabilities in similar conditions. The same holds true for a combined basic/electro-optical battery.

On the whole, such method allows us to effectively define the role and the place of the basic model and its Pantsyr-S1-O derivative in case of joint employment in AD groupings. For example, a reasonable composition of the Pantsyr-S1 battery in Russia is likely to include 50-60% of basic versions and 40-50% of derivatives with electro-optical guidance. To reinforce groupings against low altitude attacks of future weapons in almost any climatic zone, as well as in all the regions with mostly cloudless sky, it is possible to tailor purely Pantsyr-S1-O batteries or Pantsyr-S1-O-heavy batteries when no attacks of extreme density are expected. Such approach to equipping Pantsyr-S1 batteries with different modifications in the face of underfinancing facilitates protection of a greater number of key defence and industrial installations, and ensures faster promotion of these air defence systems in the international market owing to their high competitiveness.

V. OBRAZUMOV, Chief Designer,
V. SLUGIN, Department Head,
I. ZYUZKOV, Deputy Department Head

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VLADIMIR BRYLEV:

"OUR STRATEGIC GOAL IS TO ESTABLISH A POWERFUL GAS TURBINE-BUILDING CENTRE"

Russian aircraft industry restructuring is still under way. The process in question is based on establishing large enterprises, best suited for focusing financial resources on realising promising long-term programmes. Establishment of the Gas Turbine Engines Corporation in April 2003, which comprised flagship industrial enterprises, became another step forward in this direction.

Air Fleet correspondent Valery Ageyev interviewed Vladimir Brylev, Director General of the Gas Turbine Engines Corporation, to learn more about establishment of the new company and its plans for the future.

Mr Brylev, what enterprises have joined the Gas Turbine Engines Corporation?

The new corporation comprises MMPP Salut, Ufa-based UMPO and all of their subsidiaries and affiliates. Governmental participation in the corporation is being considered following Rosaviakosmos's proposal.

What was the basis of the merger?

The basis for establishing the new corporation embraced all those common projects and programmes, which see participation of all the parties concerned. The backbone of the merger consisted in the AL-31F augmented turbofan, mass produced by Salut and UMPO, assemblies and subsystems of which are manufactured by other plants, participating in the programme.

The companies cannot be said to have actually merged, as each participant in the programme retained its independence and legal status, as well as the right to realise its own projects. In fact, the companies teamed up in order to maximally focus their efforts on breakthrough directions, where they have already cooperated with each other and where no success can be achieved independently. The corporation is a joint stock company, with the profits divided in compliance with the initial deposits of each participant.

The meeting of founding members is the main governing body, while yours truly was appointed director general. In light of the new position I had to resign from the post of the Salut Deputy Director General, which I had held for several decades. It was a difficult decision to make, but it would have been physically impossible, and besides incorrect, to work part time on both jobs. Director general of a corporation should be above the interests of a particular enterprise and should only defend those of the corporation.

What do you think the main objective of the newly established corporation is?

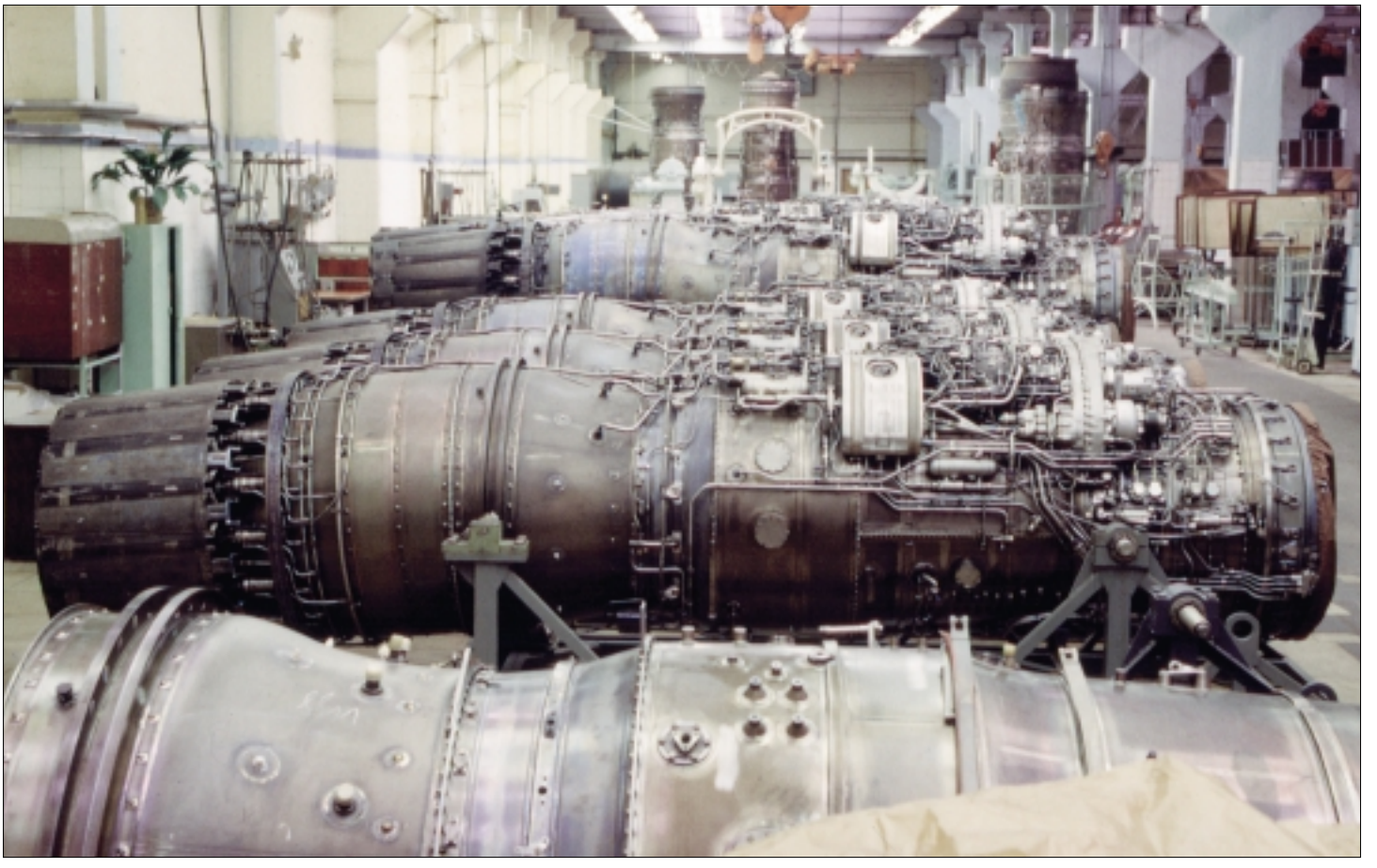
The strategic objective of the corporation is to establish a powerful gas turbine-building centre, featuring its own design bureau and capable of both producing aircraft engines and independently developing them, employing the latest achievements of fundamental and applied science, as well as informational technologies.

MMPP Salut has the right to independently cooperate with foreign counterparts, which opens new vistas for both the company in question and its corporation partners with respect to exporting cutting-edge products, in particular, contemporary gas turbines.

In addition to developing, testing, and producing aircraft engines the corporation will also provide maintenance, repair, and consequent cannibalisation of various gas turbines, including control systems, and the rest of their units.

Another key direction for cooperation within the new corporation envisions upgrading the AL-31F turbofan, developing gas turbines for electric power and gas pumping stations, developing the D-436 engine jointly with Ukrainian counterparts, which is designed to be fitted on the Be-200 amphibious aircraft and the Russian Tu-334 regional airliner, as well as developing the new AL-55 engine.

Left to right: Vladimir Brylev, Director General of the Gas Turbine Engines Corporation; Yuri Yeliseyev, MMPP Salut Director General; Valery Lesunov, UMPO Director General



The main today's military production of the Gas Turbine Engines Corporation, the AL-31F turbofan engines for Flanker family fighters at the Salut's assembly hall

UMPO and Salut, which manufacture the same AL-31F engine, also joined the corporation. What kind of relations do they enjoy?

First and foremost, I would like to point out that they are equal partners, rather than rivals. First, they have reached an agreement on sharing the market, in compliance with which Salut is to cooperate primarily with the People's Republic of China, while UMPO with India. I would like to emphasise the word 'primarily', as now corporation members will be able to avoid needless rivalry and make greater progress in business by jointly securing niches in various new markets. At the present time Salut and UMPO exchange various engine units and jointly work on the D-436 engine.

It is common knowledge that success of any enterprise depends on the funds invested. Who are your investors?

Russian banks are our primary investors. They are eager to grant credits to our corporation, as member-companies are doing quite well. The total output in 2003 will exceed US $1 billion without VAT. We experience certain difficulties in attracting foreign investments. For instance, the amount of foreign investment insurances is comparable with the bank rate.

However, in order to undertake big-ticket programmes, for instance, developing the fifth generation aircraft engines, the corporation is going to involve seasoned experts from UMPO, NIIID, and other flagship Russian companies. Once again, our strategic objective is to establish a powerful national gas turbine-building centre.

At the present time mass media are actively discussing the issue of developing a power plant for the fifth generation fighter. What do you think about it?

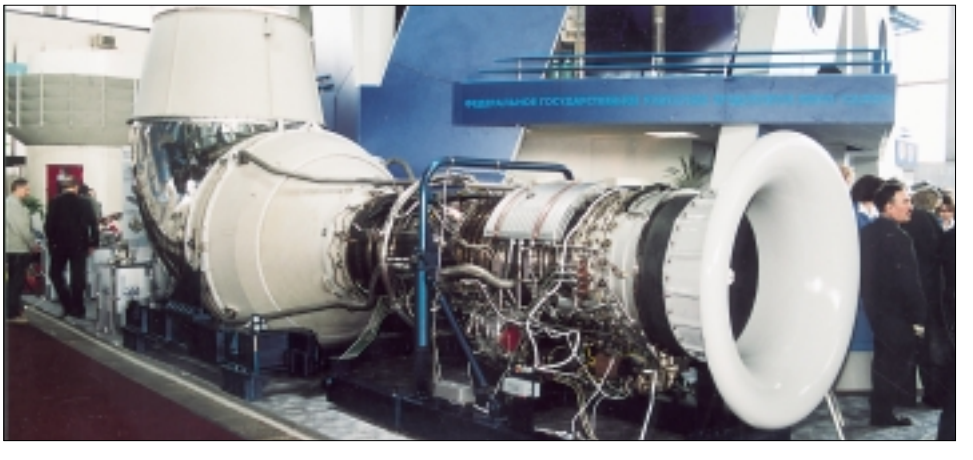
First and foremost, a power plant like that cannot be developed from scratch without a due research and development effort. Secondly, the deadlines, which were set for developing previous-generation power plants, are absolutely unacceptable nowadays. And thirdly, there are simply no such funds as were earmarked for designing new engines during the Soviet times. And finally, no one has bothered to work out specification requirements for the new engine so far.

However, the real problem is that in order to develop the fifth generation engine, it is a must both to focus financial assets of numerous aircraft plants and team up the best aircraft developers: scientists, designers, and test pilots. Then and only then shall we succeed.

What will be the trademark of the corporation at major international air shows?

We have already discussed this issue and decided to sport the common name of Gas Turbine Engines already at the MAKS 2003 air show.

Industrial powerplants derived from aircraft engines will become one of the main parts of the Corporation's production programme



PLANT'S STABILITY AS KEYSTONE TO SUCCESS

The Moscow-based Chernyshev Machine-Building Plant is one of the leading aircraft engine builders in Russia. The engines made here are operated in over 40 countries of the world. Interviewed by the Editor-in-Chief of the Intervestnik publishing house Alexander Velovich at the international aerospace show in Le Bourget, the enterprise's Director General Alexander Novikov said of the current state of affairs and future plans.

Mr. Novikov, how would you characterise the current state of affairs at the enterprise?

The most satisfying thing for us is stepping up of the production volumes of the enterprise. It is already a third year in succession, beginning from 2001, that the production output is constantly growing. In 2003, we expect the volume to grow by another 30 percent as compared to the previous year. The factory is working stably. As a result, the number of personnel employed also grows at quite a quick pace. And all of them are well-paid. According to our estimates, where the salaries are concerned, we rank third-best among the aviation enterprises of Moscow.

The growing production volumes also allowed us to undertake a large-scale technological re-equipment of the enterprise. First of all, we decided to adopt the most advanced principles of the enterprise organisation. Among the most important of them is the idea of creating a single information system and making manufacturing technologies base on it. We are going to develop a mathematical model of the engine to be used for the purposes of design, technologies development and preparation for putting into production. It is toward this end that we have acquired a lot of computers. At the same time, we have plans to purchase many sophisticated machines of foreign makes to equip the workshops.

A total of $15 million was invested into the programme of the technical re-equipment of the enterprise. The amount is going to grow to $40 million in the near future. After we had announced the tender on delivery of equipment, nine vendors applied to participate in it.

RD-33

Do you plan any structural changes of the enterprise?

As a matter of fact, yes. This year MiG Russian Aircraft Corporation made a decision to found an engine-building holding, based on our enterprise. It will include the Klimov plant, the Krasny Oktyabr plant, the Tushino-based Soyuz Design Bureau.

As the first step for such reorganisation, the MiG Engines and Reductors managing company was founded. Currently, the process of consolidation is coming to end, implementing the Governmental Decree No. 713 on the reform of the defence industry.

What stages will you have to go through while making up the holding?

As I have already said, the managing firm has been founded in the form of the limited liability company that will start to coordinate the activities of all the aforementioned participants. Within its framework, directorates will be created that will be responsible for certain programmes. Our task is to attract investors for their implementation. One can waste time arguing, what scheme of organisation is more preferable, but we are positive that the programme-oriented management via a managing company will allow us to successfully develop, as investments will only be available for the programmes, on which orders have been made.

Further on we plan to reorganise this company into a holding attracting funds and issuing shares. As I have said, the work is being carried out under the aegis of the MiG Corporation in compliance with the governmental decree.

What are the priorities of the company?

I think that today there are quite a lot of them. First of all we are coming to the final stages of the

RD-33 derivative development featuring the thrust increased to 9t. Designated RD-33MK, the engine will power deck-based MiG-29K fighters for the Indian naval aviation. The claimed thrust growth is enough to meet the requirements for the aircraft of the type. There is a large and serious work to be done shortly.

In addition to growth of the bypass ratio, the upgraded blades cooling system will allow deriving an engine with a considerably greater thrust of about 11t. It will be the next stage. The work on it is already underway. The new engine will feature a significant growth in the temperature of gases before the turbine increased to 1,850 degrees. Currently, the maximum temperature is 1,715 degrees at the emergency power.

Are you deriving anything else from the RD-33 engine?

Another modification, designated RD-93, will feature low position of the aircraft accessory box. Presently we are negotiating delivery of the engines to China. We hope that the negotiations will successfully result in signing a contract later this year. The Chinese aircraft-building corporation presented the FC-1 Super-7 aircraft in Le Bourget. Its documentation reads that it will be powered by RD-93s.

How is it going with the RD-1700 engine for the MiG-AT trainer?

Probably you are aware that the prototypes of the aircraft are equipped with the French Larzac engines. Their manufacturer, Snecma, works to increase its thrust to 1,700kg. We are developing the similar RD-1700. I think we will reach a reasonable agreement with the French company, and join efforts within the framework of a single project of developing an engine with increased thrust. We will take the best from both engines and after that work cooperatively on the Russo-French version. Now I cannot tell you its designation. It is likely that the cooperation agreement will be reached later this year. My words base on the results of the bench tests of our engine. We have managed to meet almost all the specifications requirements in terms of thrust, cyclic fuel consumption, dimensions and weight. It is easier for us to negotiate with our French counterparts in such a situation.

Are you still working on the TV7-117 turboprop engine and its modifications?

Yes, we are. The engine powers the Il-114 aircraft now. It is likely to be installed on the light military transport, which is currently being developed. The enterprises of our holding are working on deriving a turboprop engine for helicopters from the TV7-117.

Are you still manufacturing Neptun engines for boats?

Oh yes, and the sales volumes even grow, not much, but by at least 8% this year. Moreover, the new modification was put into production recently featuring good performance, new design and the new reliable ignition system. But in order to develop the enterprise at the expense of boat engines, millions of them must be sold, which is impossible due to high saturation of the market. So, our main products are aircraft engines.

In addition to our traditional specialisation, we have taken up development and production of 20MW power units, based on our production R29-300 turbojet. And they are in demand now.

What do you do to ensure good skills of the personnel?

We pay special attention to the issue. The salary at the enterprise is high, even for Moscow. We also employ people from other towns and accommodate them. We have a special programme, according to which our employees get own flats after 15 years of work at the enterprise. To this end, the construction of a house is underway in the Nakhabino district of Moscow now.

We invite young specialists, providing enterprise scholarships to them during the term of instruction. After they graduate, they get a solid salary. So, we can say that young talents come to work with us. On the whole, the number of employees has grown by a thousand this year.

Besides, we place orders at other enterprises to optimise expenditures. The matter is that a bit away from Moscow, out of the Golden Ring, many factories have no work to do. So, they are willing to take our orders at plausible prices.

Are you looking forward to getting a licence to enter the international market?

No, we are quire satisfied with our cooperation with the MiG RAC and Rosoboronexport. When signing contracts, we pay commission to them, which is quite plausible. Today, many try to get licensed for operation in the foreign market, which might result in unnecessary competition.

As a matter of fact, the market has changed lately. Customers demand vast offset programmes on export contracts, and services at their quarters. Many organisations are engaged into repair of materiel, and usually without permission of manufacturers. I think that we have unearthed a reasonable solution. We certify repair factories abroad, sign contracts with them on delivery of spare parts, elements, equipment for benches and design documentation. At the same time, the enterprises have a right to repair our products in the interest of their country and only on condition of purchasing spare parts form our plant. It means that we entrust the customers with assembly and testing, while keeping delivery of spare parts and elements to us.

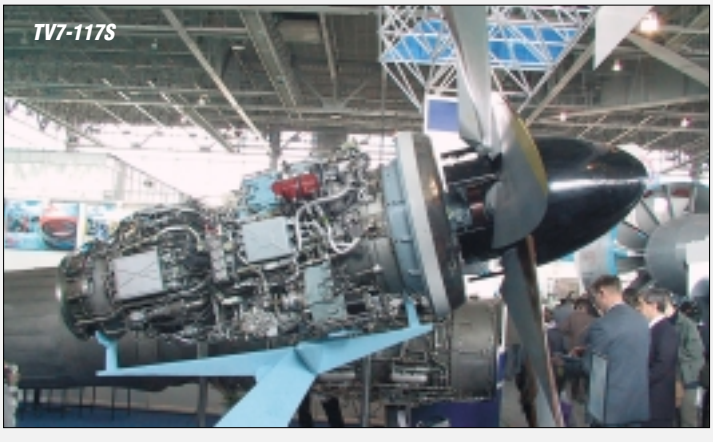
Where delivery of spare parts for repairs is concerned, strange things happen: spare parts are sold by aircraft repair factories or some ill-famed mediators, with their quality far from good. This grey business mostly bases on the difference between the prices in the internal and international markets. Our contractual scheme rules out such a problem. The current practice was introduced about a year ago, and in compliance with it we receive information of the amount of work by our certified partners. This is a normal and civilised type of relations. We have only two such contracts now. They are coordinated with the Committee for Military and Technological Cooperation and with MiG RAC.

Summing up, can you say that the enterprise is stable now?

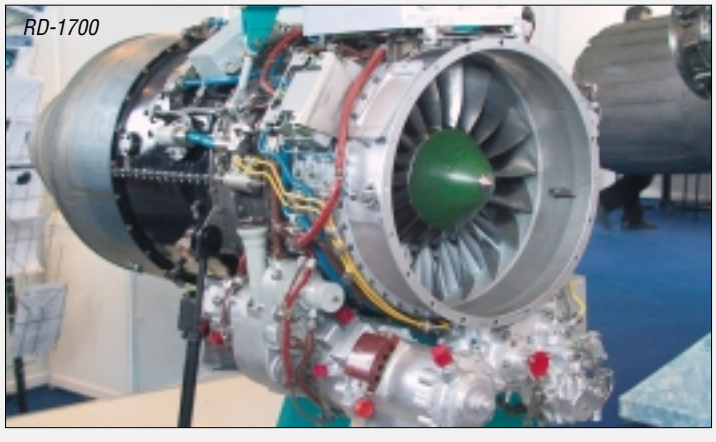
Yes. Our present condition is stable, and the future also seems encouraging. Among the best achievements of the latest three years, I would mention the stable growth of orders portfolio, and development and putting into production of aircraft engines and their derivatives with specifications, meeting up-to-date requirements.

If we manage to develop an integrated engine-building company under MiG's auspices, we will be able to continue our confident walk forward and solve scientific and manufacturing problems. The process of integration never goes smoothly. We have problems, too, but we are dead-sure we will solve them.

Thank you for the interview, and good luck to you in business.



TV7-117S



RD-1700

PROGRESS OFFERS NEW ENGINES FOR NEW AIRCRAFT

The state-owned Zaporozhye-based Ivchenko Progress design bureau is one of the leading enterprises involved in development of aircraft engines and gas-turbines for industrial power units. In May 2003 it turned 58. Over the past years the enterprise has gained a wealth of expertise in development, fine-tuning, certification, maintenance and modernisation of different types of aircraft engines and ground power units.

Many of the Ivchenko-Progress engines became pioneers of the type. Among them is the first Soviet AI-20 turboprop with extended service life, the first Soviet AI-25 turbofan for short-haul airliner, the first Soviet D-36 three-shaft high bypass ratio turbofan, the first Soviet D-18T turbofan with a thrust of over 20,000 kgf, the world's most powerful D-136 helicopter engine and, last but not least, the world's first D-27 propfan.

The engines, designed by the bureau, power 57 types of fixed-wing and rotary-wing aircraft operated in 109 countries around the globe. The high level of the Ivchenko-Progress designs is proved by certificates of the CIS IAC Aviation Register and the international BVQI Veritas.

D-436-148

One of the priorities of the State Programme for Air Industry Development in the Ukraine consists in development and manufacture of the An-148 medium-haul airliner, capable of seating 70-80 passengers. The Antonov ASTC has begun assembling the second An-148. Construction of the first prototype is expected to be completed in late 2003. On 28 February 2003, its airframe was ready. Currently, assembly of the An-148 centre wing section is underway at KSAMC, while the preparatory work on assembling wing panels is nearing completion. An-148 flight tests are planned for the late 2003, while already in 2004 the aircraft is going to get a type certificate after certification tests.

The aircraft will be powered by the D-436-148 modification of the D-436T1 engine, developed by Ivchenko-Progress. The developer cooperated with the Motor Sich Company and some Russian manufacturers on production of the engines.

The engine is equipped with a FADEC system with simplified hydro mechanical back-up control system.

Engine specifications

	D-436-148B	D-436-148D
Take-off power		
(SAC; P=760 mm Hg; H=0; M=0)		
thrust, kgf	6,400	6,830
specific fuel consumption, kg/kgf•h	0.36	0.36
(SAC+10 deg C; H=6,100m; M=0.5)		
thrust, kgf	3,100	3,100
Max emergency power		
(P=760 mm Hg; M=0)		
thrust, kgf	7,100	7,500
Max continuous power		
(P=760 mm Hg; M=0)		
thrust, kgf	5,540	5,980
(H=1,100m; M=0.75)		
thrust, kgf	1,600	1,600
Max cruising power		
(H=1,100m; M=0.75)		
thrust, kgf	1,500	1,500
specific fuel consumption, kg/kgf•h	0.62	0.62

AI-222-25 ENGINE

The design bureau has been engaged in design of jet engines for training aircraft for 35 years now. The AI-25TL engine propelling Czech L-39 trainer was derived in 1969 from the production AI-25 turbofan that used to power Yak-40 airliner, and from the AI-25T engine, developed for the then-T-8 warplane (future Su-25). In 1973, the AI-25TL passed official tests and was put into production at the Motor Sich plant. For 30 years, engine-builders have assembled about 5,000 such engines, their total flight hours amounting to over 6 million. Today this engine operates successfully in 37 countries around the world. It is installed on about 3,000 L-39 of the Czech AERO Vodochody firm.

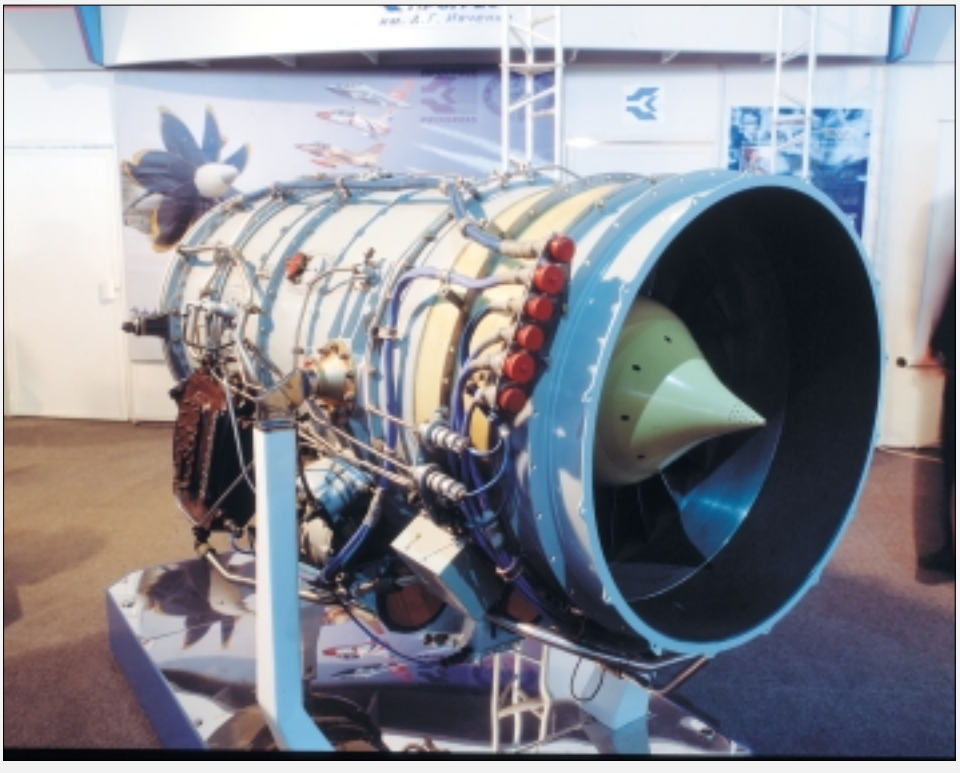
Capitalising on the AI-25TL development experience, Progress designed the DV-2 engine, rated at 2,200 kgf, at the request of the Czech partners to power the L-59 derivative of the L-39 trainer. It had been made by the late 80s and put into production at the Povazske Strojarne plant, Slovakia. Cooperatively with the Klimov plant, St. Petersburg, the engine was modified to power the Yak-130D demonstrator, its maiden flight performed on 25 April 1996.

Today's new generation trainers and combat trainers must be as agile as the 4th and 5th generation fighters at sub-sonic speed. Therefore, new engines are required, with increased thrust both at takeoff and operational power.

Among them is the AI-222-25 engine, which is currently under development at Ivchenko-Progress in cooperation with the Moscow-based Salut and Zaporozhye-based Motor Sich.

The engine comprises a high-pressure compressor (with an additional stage at the intake) and combustors of the AI-22 engine, currently being developed by Ivchenko-Progress for the new medium-haul Tu-324 airliner. The first launch of the full-scale AI-22 was held on 26 September 2000.

Ivchenko-Progress built several prototypes of the AI-222-25 engine in cooperation with Salut and Motor Sich, who will put it into production later on. In November 2002, bench tests of the AI-222-25 gas-generator started, while in June 2003 the full-scale prototype underwent trials. Later in 2003, the engine will go for flight tests as part of the power plant for the Yak-130 trainer.



The Yakovlev Design Bureau is going to build four production Yak-130s and make the first of them fly before the yearend. Official tests of the AI-222-25 are scheduled for the first half of 2005.

The AI-222-25 is the basic version for deriving a whole bunch of engines for training and light combat aircraft. The family currently includes:

- AI-222-25 basic variant without afterburner rated at 2,500 kgf;
- AI-222-28 modification with higher performance of thermodynamics cycle and an increased thrust of 2,800 kgf;
- AI-222-25F modification of the AI-222-25 turbofan with afterburner and a takeoff thrust of 4,200 kgf (thrust increased by 1.68) for trainers, combat trainers, and light combat aircraft with max M=1.5;
- AI-222-25KFK modification with a "short" afterburner and takeoff thrust of 3,000 kgf (thrust enforced by 1.2) for aircraft, using only one afterburner power mode in flight;

In order to improve manoeuvrability and take-off/landing characteristics of aircraft, all the AI-222 family of engines can be equipped with thrust vector control systems, ensuring all-round deflection of the jet stream to the angle of 20 degrees from the engine axis.

In addition to the Yak-130, the engines are likely to power other aircraft, undergoing development and modernisation now. Owing to the optimum ratio of thrust and fuel consumption, low level of noise and emission, long service life and small maintenance costs, meeting the requirements of the 21st century, the AI-222 family will allow developing a whole range of quite competitive aircraft.

Sergei MIKHAYLOV

TEKHNOKOMPLEX: FUTURE FORGED TODAY

You can hardly distinguish Sukhoi's upgraded Su-27SK from its single-seat brothers. You might notice the optronic sighting sensor moved slightly to the starboard. And still, it is a completely a new aircraft. The aircraft filling and capabilities is what matters, rather than its appearance. The capabilities depend on avionics developed by the Tekhnokomplex science and production centre. The upgraded Su-27SK features an improved weapons control system, better target killing capabilities, an enhanced navigation system interoperable with Glonass/Navstar, and a new cockpit management system, which helps a single pilot manage a variety of tasks usually accomplished by two in the Su-30MK.

Over about 50 years the Ramenskoye Instrument-building Design Bureau (RPKB) has developed several generations of avionics installed on the Su-17, Su-25, MiG-23, MiG-31, MiG-27, Su-30, Yak-38, MiG-29, Su-27, Tu-95, Tu-160 and many other aircraft. Five years ago, the bureau worked out a Programme for modernisation and development of new avionics for modern fixed-wing and rotary-wing aircraft. The basic avionics suite utilises the concept of interchangeability, modularity and open architecture of both equipment and software, which allows applying transparent technology of development and modernisation.

The basic avionics suite is the single aircraft control system that includes the modular data and management system, the integrated data processing system, the system ensuring group operations, the landscape synthesiser on radar and thermal images and, to crown it all, the single management technology with improved controllability, maintainability and operability.

The structural principles of the avionics suite were used to develop such equipment for Su-27M, Su-32, Su-30MK, MiG-29SMT warplanes, and the Mi-28N, Mi-28PN, Ka-31 and Ka-52 helicopters. It is owing to the equipment of the Su-27 fighter with an additional computer and a multifunction colour display that the aircraft was upgraded to the level of a multirole aircraft, capable of countering aerial threats and killing a variety of ground targets with precision guided munitions.

A peculiar feature of the system developed by RPKB consists in the fact that the whole expertise of the enterprise in working with the Su-27 family was used for it. It is also proved by the fact that the aircraft has not only additional equipment installed, but a complete system for solving combat missions developed on the basis of a systematic approach. We took into account the existing Russian and foreign standards of combat employment. The equipment can process radar and TV data, and digital graphics. Moreover, the new units do not need any significant alterations in the aircraft structure.

It is possible to integrate elements of foreign make into the avionics. We already can boast unique experience in equipping the Su-30MKI with combined avionics from Russia, Ukraine, Israel and France. By the by, we signed a cooperation agreement with French Thales and Sagem at the 45th air show in Le Bourget. The main field of partnership is modernisation of the

Top: Sukhoi Su-27SK upgraded fighter incorporating new avionics designed by Tekhnokomplex science and production centre

exported Su-27 and other aircraft, and foundation of service centres for their maintenance. The partners also agreed to develop new aircraft together. According to Tekhnokomplex Director Guivi Djandjgava, a new aircraft will be developed, and each country will modernise it depending on its needs.

The company is active not only in implementation of the contract on delivery of Su-30MKI fighters, but also in organisation of licensed manufacture of 140 such fighters at the enterprises of the Indian HAL Corp. The Su-30MKI avionics suite includes the equipment of Indian, French and Israeli makes. However, the modular design remained intact, as did the complex processing of the sighting, navigation and video data, and the integrated cockpit management system with multifunction displays, precise navigation in any weather by day and night.

The new avionics suite is distinguished by the unified approach to its development and production. Therefore, it equips the Su and MiG families and Mi-24, Mi-28, Ka-60 and Ka-52 helicopters. Such unification is also possible owing to the structural integration of the Russian instrument designers. In 1997, RPKB proposed to establish the Tekhnokomplex Corporation integrating five developers and two manufacturers of avionic equipment. Of paramount importance are technological compatibility, single production cycle and cooperation. As of now, the corporation includes 16 independent research institutes, and design bureaus located in Moscow, Moscow Region, St. Petersburg, Kursk, Ekaterinburg, Perm, Kazan and Cheboksary. In March 2003, the corporation was joined by new members, namely the Tomilino-based Zvezda company, the Zhukovsy-based research institute of aircraft equipment and the Orekhovo-Zuyevo-based KAMPO company. The enterprises develop and produce most of the avionics sub-systems, thus laying a stable groundwork for the whole corporation. Knowing the opportunities of modernisation of these elements, Teknokompleks is capable of forecasting the trends of avionics development and can manufacture truly commonised equipment.

Su-27SK upgraded cockpit

Tekhnokomplex President Guivi Djandjgava (right) and UOMZ Director General Eduard Yalamov (left) at the Paris air show

A peculiarity of the corporation consists in the collegial control system that allows dwelling on the matters of science and manufacture, rather than on the problems of controlling financial flows. We go by an Oriental proverb, reading "Never fight without necessity, and, if necessary, win without fighting." Investment and scientific policy of the corporation feature high level of coordination, which allows minimising the development and production costs. At the same time, most of the profit is used to sponsor research and development, re-equipment of the factories and introduction of CALS technologies.

At the MAKS-2003 air show, the corporation will exhibit both the multirole fighter avionics as a whole and its separate elements. These will include the IKSh-1M collimator wide-screen display, LCD active matrix modules, the MFPI-6 and MFI-10-6M multifunction displays, LCDs and many other things. But the highlights of the Tekhnokomplex's MAKS-2003 exposition will undoubtedly be mock-ups of equipment for the cockpit of the fifth generation fighter. Having won the tender, the corporation will make the piloting and navigation system for the future fighter (in cooperation with Aviapribor-Holding), and RPKB will create the computing media. Also held was the tender on the surveillance and sighting optical and infrared imaging system for the future aircraft. Another member of Tekhnokomplex won it, namely the Ural optical and mechanical plant. Also, R&D enterprises are developing the weapons control system for the fighter (Aviaavtomatika design bureau and Pribor plant from Kursk), fuel management system (Tekhpribor from St. Petersburg), ejection seat (Zvezda from Tomilino, Moscow Region) and some other components of avionics.

The "intellectual" K-36D-3.5E ejection seat, which was first shown in Le Bourget, saves pilots in most hazardous situations owing to its integration into aircraft avionics suite. Thanks to the modular design, it is possible to derive a whole "3.5" family from the seat to equip bombers, attack aircraft, trainers, and VTOL planes. As to the future fighter, the seat is to undergo further modernisation to equip it.

Cooperatively with the Sukhoi Company, Tekhnokomplex is developing the cockpit for the fighter. "Today we have already made a big step forward in the sphere of systems with open architecture, which will ensure continuous sophistication of avionics," said Guivi Djandjgava. "The avionics suite for the fifth-generation fighter will feature first inventions now being used for modernisation of Su-27 fighters for the Russian, Chinese and Indian air forces. You can see certain trends of avionics development already. We are introducing these innovations in the "4+" generation aircraft. By the time the basic technologies are developed and new systems come into being, we will improve and sophisticate avionics owing to its open architecture. So, through implementing state-of-the-art technologies, we expect to develop the fifth generation avionics stage by stage, but in set terms."

UNIFIED WEAPON CONTROL SYSTEMS
FOR TACTICAL AND STRATEGIC AVIATION

Anatoly Kanashchenkov,
Director General, Designer General,
Phazotron-NIIR JSC, professor,
Doctor of Technical Sciences
Vladimir Frantsev,
Chief designer,
Research centre chair, Phazotron-NIIR JSC

The recent global politico-military and economic changes have had a dramatic influenced on designation of contemporary fighters, whose former primary missions of intercepting enemy bombers and engaging fighter escorts have been supplemented by a number of additional functions. Contemporary multifunction fighters deliver precision strikes against ground and sea-surface targets and carry out a range of other combat missions that are impossible without advanced electronic equipment, including advanced airborne radars.

Phazotron-NIIR corporation has a vast experience in development of aircraft radars. So-called radar sights of the 1950s and 60s were developed into radar sighting systems in the 1970s; those, in turn, evolved into weapon control systems in the 1980s and finally into fire control/defence control systems. The latter, as distinct from weapon control systems, incorporate ELINT and ECM equipment, and for some types of aircraft there is a second radar to protect the rear hemisphere. Since airborne radars remain the only onboard systems that provide round-the-clock target information in any weather and any season, and have the longest range, all the other target information systems are now built around them.

Phazotron made a breakthrough in developing advanced radars by introducing a uniform radar system that comprises two baseline radars and unified series of components. Instead of developing a separate radar for each type of aircraft, the corporation can now adapt the baseline version to every new aircraft type. Depending on the aircraft's mission, the radar control software and signal processing module is adequately adjusted for interfacing with other aircraft systems.

Moreover, such a unified radar can be used not only in fighters but also in assault aircraft and bombers, and also in naval and ground-based military equipment.

For example, the Zhuk-ME radar, one of our baseline versions, provides the following functions for air target interception:

- target detection and target airspeed measurement;
- target detection and target range measurement (in free airspace and against Earth (sea) back-ground);
- tracking of single targets;
- tracking of multiple targets (up to 10) while maintaining airspace monitoring; simultaneous attack of up to four targets;
- dogfight support;
- detection and engagement of hovering helicopters;
- target type identification (large, medium, small);
- target class identification (jet, prop, missile, helicopter);
- determination of the number of targets in a group;

When employed in ground missions, the radar supports:

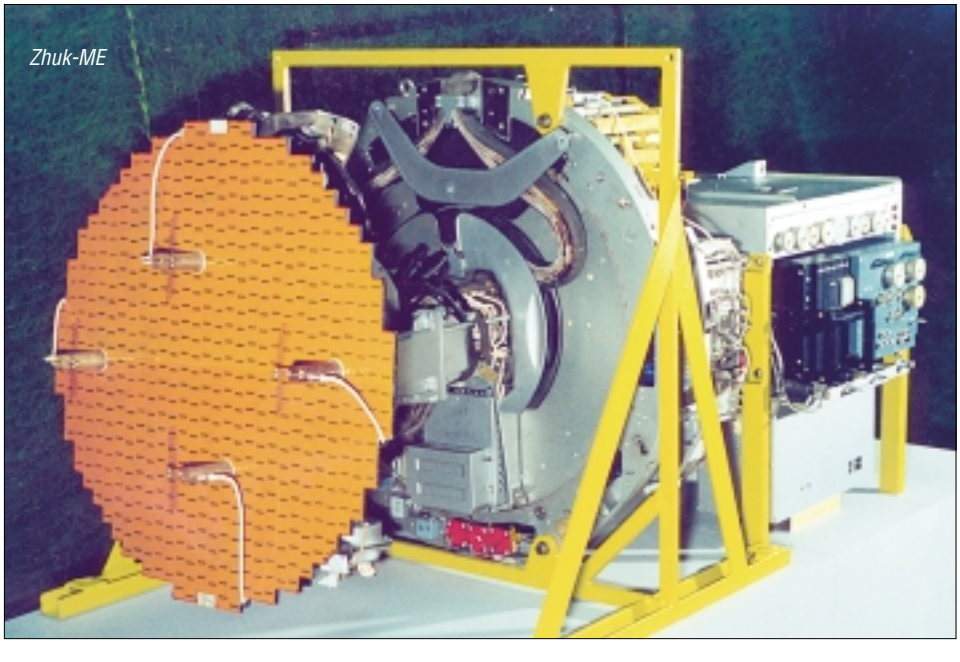
- varied resolution terrain mapping implementing the real beam, Doppler beam sharpening and syn-thetic aperture radar modes;
- map scaling and map freezing modes;
- simultaneous tracking of up to four targets;
- sea surface surveying;
- detection and tracking of moving ground and sea targets;
- measurement of ground slant range;
- obstacle avoidance support in low altitude navigation;
- weather detection at a range of up to 600km.

The Zhuk-M radar family comprising the Zhuk-ME, Zhuk-MFE (with the FAR-700 antenna for the MiG-29SMT2 and MiG-29K aircraft), Zhuk-MSE (for the Su-27 and Su-30MK3 aircraft) and Zhuk-MSFE (with the FAR-980 antenna for the Su-27KUB), and also the Kopyo radar family for MiG-21 light fighters and Su-25 assault aircraft, fall within the 4+ radar generation category. They feature longer detection and acquisition range, extended simultaneous target tracking and engagement capabilities, high mapping resolution (3-5m) and are better at identifying the target type and determining the number of targets in dense groups.

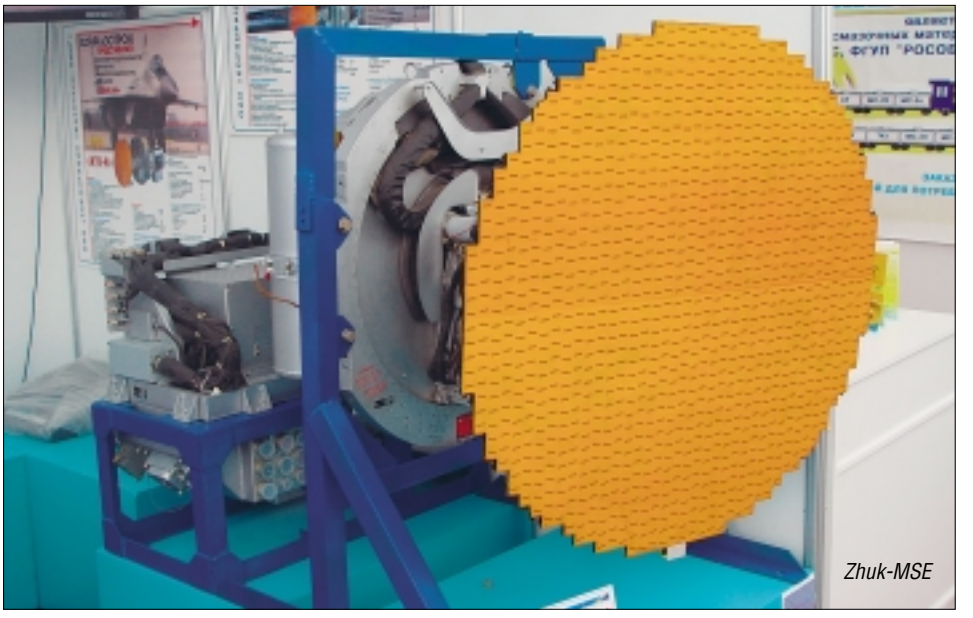
The Zhuk-MSFE (Sokol) radar offers even better performance. This radar, built around a phased array antenna, implements more efficient discrete precision tracking algorithms for multiple targets (including manoeuvring targets), provides reliable target prioritisation and has improved jamming resistance.

As radars acquire new functions, the requirements of their reliability get more stringent. Phazotron-NIIR addresses this both in the development phase and through introduction of new production and servicing technologies.

The Corporation currently participates in the programme to develop a fifth generation fighter. Apart from the obvious aim to further enhance



Zhuk-ME



Zhuk-MSE

aircraft efficiency, this programme pursues the goal of cutting all possible costs on development, operation and combat application. Constant complication of the battlefield environment preconditions the necessity of constantly extending the capabilities of all information systems, first of all those of airborne radars.

In its efforts to enhance combat efficiency of aircraft the Corporation handles the following critical problems:

- develop uniform interconnected algorithms for flight trajectory control, radar operation mode control and weapon control for mutual adaptation of the aircraft and onboard information systems, including introduction of the trajectory observation control concept;

- develop procedures for information support to group aviation operations, including in the framework of a uniform multiradar system;

- provide for efficient operation of information systems in hostile jamming environments.

Increasing the cost-effectiveness of aircraft systems is one of the key aspects of radar development. For cash-strapped customers, this factor may prevail in choosing the type of radar. In their work to address the radar cost-effectiveness problem our developers focus their efforts on three groups of tasks: cut the radar life cycle cost; increase the cost-effectiveness of combat actions and reduce losses among friendly aircraft.

The first group of tasks comes with a host of associated design, technology and organizational problems. Our standing objective is development of a baseline open-architecture radar that would function for 12-15 years without upgrading and could be enhanced through software build-up only, without changes to the hardware, thus permitting introduction of numerous specialized modifications.

We focus special attention on further strengthening multifunctionality of aircraft and airborne weapons, introducing corresponding radar operation modes and eliminating waste of expensive weapons and materials (fuel, etc.) in air combat.

Rational application of airborne guided weapons largely depends on how reliable the airborne radars are in identifying targets and prioritising them. Obviously, reliable target type identification is only possible if the radar correctly processes the results of accurate spectral analysis run on signals and data obtained from the ELINT station and other information systems. And reliable target prioritisation must be based on more complex criteria adapted to the composition and functions of information systems.

The task to reduce losses among friendly aircraft can be addressed through enhancement of aircraft protection. This requires settlement of several problems, first of all introducing a spherical information field around the aircraft, including the use of the rear hemisphere radar, and adding extra coverage zones to the functions of the forward hemisphere radar, thus enabling more efficient evasive maneuers and more accurate application of weapons and electronic countermeasures.

Development and application of active phased array antennas (APAA) is the merging point for tactical, economic and technological factors influencing the appearance of prospective radars.

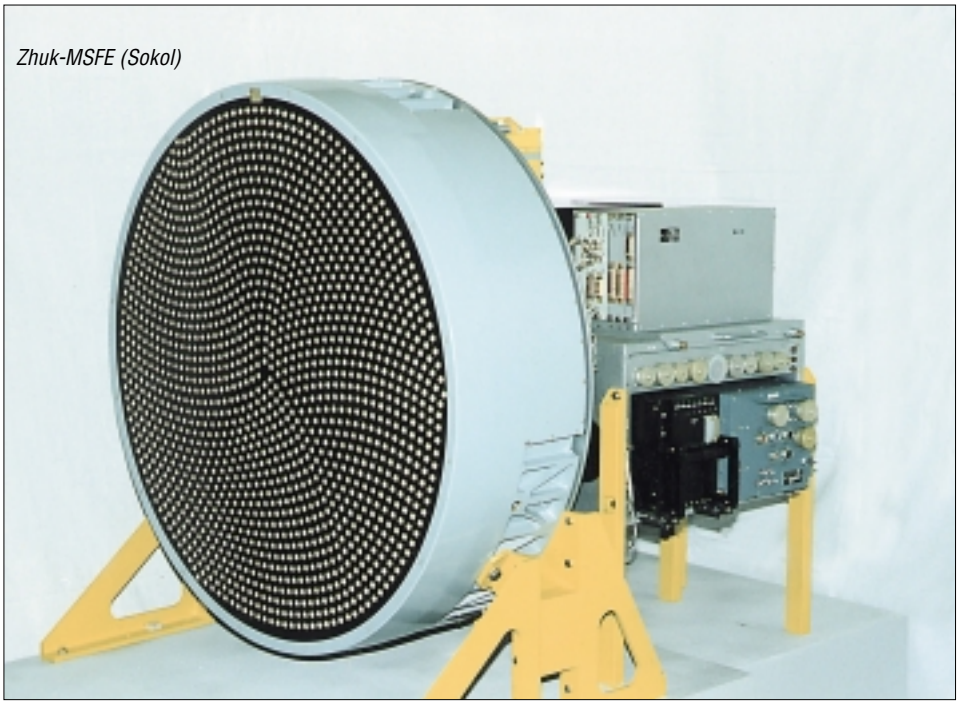
Multifold extension of the operating frequency band has permitted APAA application in detection and ranging, electronic intelligence, electronic warfare, navigation and communications, thus providing hardware integration of different electronic systems, maling onboard equipment smaller and lighter, and reducing radar signatures of aircraft. APAAs can form several independent beams simultaneously, a capability sufficiently expanding the radar's instantaneous field of view and enhancing situation awareness.

APAA development is no isolated problem, and should be undertaken simultaneously with development of associated software for optimal implementation of APAA capabilities.

Phazotron-NIIR is a dynamic Russian enterprise engaged in development of radars for tactical and strategic aviation and a range of other military applications. The Corporation sees its mission in improving combat efficiency of aircraft and other military equipment that will have to remain in service for decades.

It is impossible to adequately increase combat efficiency of in-service military equipment through pin-point improvements, and operation of such equipment will prove much more expensive. The answer, therefore, is to implement modernisation on a higher technical level and replace the existing radar with a new one!

Zhuk-MSFE (Sokol)



ELARA'S PRODUCTS:
IN THE SKIES AND ON THE SEA

The ELARA Cheboksary Research-and-Production Instrument-Making Enterprise, founded in 1970, is a member of the Tekhnokomplex Scientific and Production Centre, which unites 16 developers and manufacturers of avionics. Within the framework of its Tekhnokomplex activities ELARA specialises in the production of printed circuit boards, electronic units, airborne computers and display systems.

The forecasted recession in the aircraft market has forced the enterprise to seek new market niches for the purpose of diversification. With our three-decade experience of producing, and ten-year experience of developing hi-tech products, we have employed our expertise in aircraft avionics to enter the maritime navigation market.

Our first effort in this direction became the DS-83 Gorizont electronic magnetic compass developed by our design engineers.

The compass is designed to be used in sea and river vessels, including speedboats, and also in hovercrafts and hydrofoils. The compass determines the magnetic and true heading, deviations from established heading, rolling and pitching angles, and provides information in the IEC 61162-2 (NMEA-0183) international format. The DS-83 automatically calibrates within one full circulation cycle (including in pitch/roll environments).

The compass has certificates by the Russian Maritime Register of Shipping and Russian River Register.

DS-83 Compass

KTM-210 automatic identification system transpoder

Modifications of the DS-83 Gorizont compass may be used in ground vehicles, mapping systems and ground navigation systems.

Over the past five years ELARA has invested more than $50 mln into state-of-the-art equipment and computer-aided design systems both for its mechanical and PCB production lines. In 2001 the enterprise introduced the BAAN integrated management system. ELARA successfully applied its increased capacities to the second maritime project: a universal automatic identification system (AIS), a mandatory asset for all ships of 300 gross tonnage and upwards under Chapter V of the SOLAS Convention.

The AIS is designed for navigation information exchange between ships and coastal services to ensure collision avoidance and assist in the efficient navigation of ships.

ELARA produces the hi-tech AIS under license from the Japanese company IZUMI BOEKI Co Ltd.

It took ELARA under four months to prepare manufacturing equipment based on the Japanese conceptual design. Japanese specialists ran a quality system audit and greenlighted the manufacture of the pilot batch. In June 2003 the first AIS systems were delivered to the Nizhny Novgorod Inspectorate of the Maritime Register of Shipping.

ELARA currently produces two AIS modifications:

1. AIS Transponder KTM-201 with a GPS reciever designed for export and installation in foreign-flag vessels (certificate from Japan's Ministry of Posts and Telecommunications; approved by the Maritime and Port Authority of Singapore).

2. AIS Transponder KTM-201R with a GPS/Glonass reciever meeting the requirements of the Russian Maritime Register of Shipping (certificate from the Russian Maritime Register of Shipping; approved by the Russian Merchant Fleet).

Harmonious efforts by Japanese and Russian specialists enabled ELARA to become the first Russian enterprise to launch AIS production.

ELARA personnel employ their profound experience in development and production of sophisticated electronic equipment to quickly adapt any technical documentation and launch production.

We are ready to consider proposals from foreign companies as regards production of their competitive products with the use of our capacities.

http://www.elara.ru

KAB-500Kr-E guided bomb

REGION

FSUE State Scientific and Production Enterprise

KAB-500LG guided bomb

KAB-1500LG-F-E,
KAB-1500LG-Pr-E, KAB-1500LG-OD-E
guided bombs with gyro-stabilized laser homer

LGB-250 guided bomb

KAB-500S-E guided bomb
with GLONASS/GPS navigation

KAB-1500Kr, KAB-1500Kr-Pr, KAB-1500Kr-OD
guided bombs with TV homer

KAB-500Kr-UPK
and KAB-500Kr-UNU
target acquisition equipment

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LE BOURGET UNDER NOGA'S THUMB

WORLD'S LARGEST AIR SHOW LACKS RUSSIAN AEROBATICS STARS

The international air show at Le Bourget has traditionally been the world's most impressive show of the kind. However, in the year of aviation jubilee, a slight drop in the number of participating nations was observed, with 38 countries appearing at the show, which is minus three compared with 2001. The number of attending aircraft (201) dropped by 25. It was an evident disappointment that Le Bourget failed to see Russian aircraft. Right on the eve of the show, the Russian authorities decided against sending the Su-27SK upgraded fighter, MiG-AT trainer and some other aircraft to France. The Russians had to fill the gap at their expositions and parking areas.

RUSSIA STOPPED BY NOGA

So, there were no Russian aircraft in the skies of Le Bourget, which had always drummed up everybody's attention. It was a third European show, from which Russian aircraft were banned by the Swiss Noga company. Noga already tried to arrest MiG-AT and Su-30MK at Le Bourget two years ago, so they had to take "an evasive manoeuvre" and virtually fled from the show. When an officer of the court came to arrest the aircraft, they were already gone. After this, Rosaviakosmos Deputy Director General Valery Voskoboynikov, Sukhoi Deputy Director General Aleksandr Klementyev and MiG Deputy Director General Gennady Arkhipov were sued on accusation of hijacking arrested aircraft. In December 2002, the court ruled the Russian authorities had not been guilty, and the final decision was to have been brought on 4 June 2003. However, this never happened, and the French government could not guarantee the situation would not repeat.

Yak-54 trainer became the only Russian flying aircraft at Le Bourget this year

Yuri Koptev said that the Russian embassy in France "had information that provocations could be expected" and therefore did not rule out a possibility that attempts to arrest Russian exhibits might be made at the final stage of the air show. The French court had already made a decision on Noga's suit, which was to be announced only in early July. That is why Russia did not send its state-owned aircraft to the show, and the only full-scale natural exhibits of Russian make were the ones owned by the Yakovlev Design Bureau, including the first serial combat trainer Yak-130, the Yak-54 aerobatics aircraft and the Yak-52 trainer. Since Yakovlev is a private company, de-facto Noga had no rights to put claims on the aircraft.

Sporting the Breitling logo, Russian Su-26 and Su-31 aircraft also captivated the audience with their incredible stunts. To verbalise what pilots did is next to impossible, so you'd better see it for yourself. The only thing is for sure: no other aircraft can fly like that. By the way, one of the aircraft was piloted by Brigitte Delasalle, the only Su-31 female pilot in Western Europe.

SUKHOI'S FRENCH ACCENT

Although there were no Russian warplanes at Le Bourget, the Russian aerospace industry has something to be proud of. Sukhoi's signing four protocols of intentions with West European companies was quite sensational.

On 17 June, Sukhoi signed a protocol of intentions with EADS and MBDA. EADS International Media Relations Chief Gregor von Kursell said the document was classified, but made clear that Russia and Europe will cooperate on development of next-generation aircraft. In the meantime, the joint working group will take up modernisation and after-sales servicing of aircraft and development of unmanned combat air vehicles (UCAVs). Moreover, there are plans to equip the exported aircraft with missiles of European makes. MBDA Head Marwan Lahoud described the agreement as follows: "The idea is to see how systems developed by EADS

Top: fantastic aerobatics of Breitling team pilots on Russian-made Su-26 aircraft became the most breathtaking displays at the Le Bourget flight demonstration programme

can be used to modernise superb Sukhoi aircraft. We are also considering a possibility of arming Sukhoi aircraft with some of the MBDA missiles." This might mean that the Su-30MKI fighters exported to India will get Mica missiles.

On 18 June, Sukhoi, Tekhnokomplex and Rosoboronexport signed a protocol of intentions with Sagem and Thales.

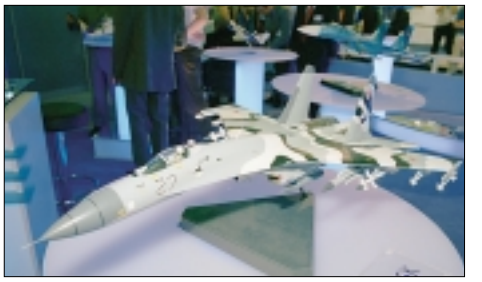
Sagem's Vice President Jacques Paccard said "the agreement bases on the successful experience of integrating Sagem's navigation system into Sukhoi export variants." Mikhail Pogosyan in his turn added "the agreement will continue our cooperation with French companies and will allow us to offer new products to future clients." President of Tekhnokomplex Guivi Djandjgava said "such partnership would be beneficial for all the participants." The sides decided to establish a joint working group to work out a cooperation programme. First of all, this will concern avionics, in particular, navigation systems, for Su-27 and Su-30 aircraft to be sold to Malaysia and Indonesia.

Thales is also going to take part in fine-tuning and modernisation of avionics for the Su-27 family, both already delivered to customers and the ones in projects. Moreover, there are joint plans to develop a new set of avionics equipment.

Sukhoi is already experienced in integration of French avionics suites into the Su-30MKI aircraft that are delivered to India. Most likely, such systems will equip aircraft built for Malaysia and Indonesia. Indonesia has expressed a desire to purchase four aircraft, but there are unconfirmed reports that the country is interested in acquiring another 42.

It is also possible that West European companies will participate in development of the Russian fifth generation fighter. Russia needs such aircraft badly both to arm the national Air Force and retain the segment of the international warplane market it has won. But that is almost important without international cooperation.

On 20 June, Dassault Aviation and Sukhoi announced that a joint working group would be set up "to examine the opportunity of cooperating on looking for new solutions in aircraft building." The working group will work within the framework of existing governmental agreements between the two countries. The protocol on establishment of the working group was sighed by Mikhail Pogosyan and Charles Edelstenne.



Su-27SK upgraded fighter wasn't allowed to visit Le Bourget and was present only in a model form

Models of the prospective Russian Regional Jet (RRJ) and SM146 engine for it

The sides are looking forward to broadening cooperation in development of a future supersonic airliner, perhaps on the basis of the SSBJ project, and also to teaming up for development of UCAVs and warplanes.

At the RRJ press-conference. Mikhail Pogosyan, Sukhoi's Director General, in the centre

RRJ, THE INTERNATIONAL EFFORT

Summing up the work of the Russian delegation to the Paris air show, Rosaviakosmos Head Yuri Koptev said that the central event of the exhibition for the Russian participants was presentation of the RRJ Russian Regional Jet. The project is being implemented by the Sukhoi corporation's affiliate Sukhoi Civil Aircraft in cooperation with the following Russian and foreign companies: Ilyushin Co., Yakovlev Design Bureau, Boeing and Snecma. It is probable that in autumn 2003 first contracts will be signed on delivery of the aircraft to air carriers. Aeroflot showed its interest as it has long been looking forward to getting new state-of-the-art aircraft of the type. Negotiations are underway with the Skyteam group of companies that includes Air France, Delta and some other. A number of western air carriers have also expressed their interest, namely Finnair, Austrian Airlines and Lufthansa. Working groups with these air carriers are likely to be set up in July to maximally specify the requirements to RRJ.

French President Jacques Chirac stressed the importance of cooperating with Russia. He said that the two countries had all the required capabilities to make a go in the sphere of aircraft

building. He spent seven minutes instead of the three planned at the Sukhoi stand, thus proving his intention to develop the relations, the groundwork for which was laid during Russian President Vladimir Putin's visit to France. It is noteworthy that Mikhail Pogosyan was a member of that delegation, too. In July Chirac plans to visit Moscow, where the negotiations are likely to go on. Sukhoi exhibited the baseline 75-seat version of RRJ. Moreover, the RRJ family will include a shortened modification for 60 passengers and a stretched one for 90 passengers. Also, there are plans to develop a version with increased range. All six modifications have similar wing shape and the same engine, as well as are greatly commonised in terms of structure and equipment, which is likely to have a positive effect on the cost of development, production and maintenance.

In April 2003, the SM146 engine was selected as the RRJ power plant. It was jointly developed by Snecma and Saturn. The mock-up of the engine was demonstrated at the Sukhoi exposition next to the RRJ 75 mock-up, while Snecma put the engine in the centre of its exposition.

The engine will undergo certification in October 2005, while flight tests are likely to start in June 2006, and already in 2007 it is expected to be put into operation.

The RRJ programme is estimated at $600 million, while the market volume is believed to amount to $10 billion. The scheduled rate of initial deliveries is 60 aircraft a year, while the production programme provides for manufacture of at least 800 aircraft.

BE-200'S EUROPEAN DRIVE

The agreement on Be-200 signed in 2001 by Rosaviakosmos and EADS was again brought to the fore in Le Bourget. About a year ago, a working group was established to carry out a study of the Be-200's market potential and, according to EADS Vice President for Marketing Jan Zesewitz, it announced there was "a rather firm business-case for the aircraft." It estimated the market potential for the coming 20 years (beginning in 2003) at 320 aircraft. "An aggressive marketing campaign" is likely to start in August 2003 at the MAKS-2003 air show.

However, it is necessary to conduct some fine-tuning to ensure successful promotion of the aircraft in the international market. This primarily concerns the power plant, as the D-436TP engine, powering the Be-200 now can hardly satisfy European customers, especially in terms of its service life. That is why the export version of the amphibian will feature the Rolls-Royce BR715, with "Rolls-Royce Deutschland expected to be a full-time partner in the programme, rather than a vendor of engines only," said Stefan Zimmerman, a representative of the company. Rolls-Royce Deutschland will participate in certification of the aircraft in the West and "will contribute to maintenance of Be-200 all over the world." The western certificate of the aircraft with BR710 engines is to be received in 2005. According to Stefan Zimmerman, "navalisation of the engines will require no additional expenditures." Irkut Vice President Valery Bezverkhny said this was the main reason why the engine had been chosen, as, for example, Snecma's motors need considerable fine-tuning for naval operation. The price of the aircraft with BR710 engines will grow by 12-15%, while the whole programme of producing 320 aircraft is estimated at $7 billion.

Nevertheless, there will be left a chance for the aircraft version with Ukrainian engines, as they are likely to be in demand in China and India, although the countries are beginning to set more and more stringent requirements to the Russian equipment. For example, the Russo-

Irkut's Project 111 model

Indian transport aircraft under the MTA programme is also going to be equipped with the BR715 Rolls-Royce engines. The mock-up of the aircraft was demonstrated at the stand of the Irkut corporation.

The most breathtaking exhibit of Irkut was the Project 111 mock-up. Currently this is just a demonstration of capabilities of the corporation that has broken the shell of a simple serial plant and gained a certain experience in developing unconventional aircraft.

Also, work is underway on military versions of the Be-200 amphibian: a naval patrol aircraft for border guard troops and an assault transport for Southeast Asian nations, as well as an ASW aircraft.

VOLGA-DNEPR TO UPGRADE AIRCRAFT

The Volga-Dnepr company brought to Le Bourget its upgrade programme for Il-76 and An-124 planes. The modernisation aims to reduce operation costs, increase service life and improve flight safety. The programme rests on the company's forecast of a two-fold growth of the cargo transport market in the coming 5-6 years.

The problem of the Il-76, like that of many other Russian aircraft, is its engines, whose characteristics do not meet European requirements. That is why Volga-Dnepr decided to re-engine its Il-76s with up-to-date PS-90As produced by Perm Motors. Certification of the Il-76-90VD upgrade is to be completed in a year and a half. In 2005, Volga-Dnepr is going to make the aircraft operational. Ilyushin Director General Viktor Livanov said "the Il-76 modernisation programme will allow the Russian air carri-

Russian delegation and EADS CEOs Philippe Camus (left) and Rainer Hertrich (right) after the meeting at Le Bourget

ers to operate the aircraft for years to come." Volga-Dnepr's specialists say it will be 15 years.

Volga-Dnepr is the largest company operating An-124 transports. Today the air carrier would like to have a more sophisticated aircraft to carry heavier loads to greater distances. That is why the company intends to invest in development of new Ruslan modifications.

One of them is the An-124-100M. Its certification is scheduled for 2004. The payload will grow to 150t, while the take-off weight to 402t. As to the noise level, the aircraft will meet the requirements of ICAO Chapter 4 Annex 16, whereas precision of navigation is concerned, it will be among the best world aircraft. Moreover, Antonov is planning to reduce the crew to four members and increase the range a bit.

The An-124-300, now under development, is an even more promising version. The peculiarity consists in a considerable increase in the range with maximum payload. To this end, the aircraft will be fitted with new engines (featuring 30-35t of thrust), presumably of foreign make. Also, the aircraft will be equipped with new avionics, and will undergo a significant modernisation of the airframe, including the wing and the fuselage. It will have a crew of three members; the range will grow to 8,100km with 150t of payload, 10,000km with 120t or 12,300km with 50t. The aircraft will boast the world's largest cargo hold (second only to the An-225).

The business plan is now being developed. Volga-Dnepr will sponsor the project estimated at several hundred million dollars, the actual cost depending on the choice of engines and avionics. Negotiations are underway with the Ulyanovsk-based Aviastar company and the Kiev Aviant plant on production of the aircraft. The latter is likely to manufacture components, while the final assembly will be conducted by Aviastar. Neither the terms nor the number of aircraft have yet been determined. According to the Volga-Dnepr forecast, "it will be necessary to manufacture about 20 aircraft" in the coming five years. Besides, "interest has been indicated in the military airlift version of An-124-300 which will make up another 50-70 aircraft." That is why it is quite possible that production capabilities of both factories will be required to satisfy the demand.

The first pre-production Yakovlev Yak-130 combat trainer, the only Russian jet at the show

Moreover, Volga-Dnepr is financing validation of the An-124-100 in Great Britain, which is going to get JAR-25-certified in 2004.

YAK-130, FIRST NEW GENERATION COMBAT TRAINER

The only purely Russian aircraft exhibited in Le Bourget in 2003 because of the aforementioned reasons was the Yakovlev-made Yak-130 combat trainer. This one was the first production plane built by the Nizhny Novgorod Sokol plant. Head of the Nizhny Novgorog delegation to Le Bourget, Vice Governor Yuri Sentyurin was quoted as saying "today Russia is able to compete with the Czech Republic, Italy and Israel." Today's task is to make the aircraft airborne, complete flight tests by 2004, and the field it with the Russian Air Force.

The Yak-130 was adopted by the Russian Defence Ministry as the basic combat trainer for the Air Force. A governmental contract has been signed to make the pilot batch in 2003-2004. Flight tests of the first production aircraft are to start in November 2003. Later this year, the airframe for bench tests will be assembled, while the second production aircraft will have been built by mid-2004. Deliveries are scheduled for 2005.

Roman Taskayev, Yakovlev's chief test pilot, will take the Yak-130 into its maiden flight this autumn

The first production version is powered by AI-222-25 engines, developed jointly by Russian and Ukrainian specialists (Motor Sich, Progress and Salut). The export configuration will have a similar Slovak DV-2S.2 engine and the Czech Safir-5J APU, as well as a custom-made avionics suite. The Yak-130 marketing is carried out by the Yakovlev Design Bureau in cooperation with Rosoboronexport. Deputy Director General of Rosoboronexport Ivan Goncharenko said, "The corporation sells what has been adopted for service. We follow the market trends and make certain efforts. We are positive that the Russian Defence Ministry has made its choice." President of the Yakovlev Design Bureau Oleg Demchenko added that "the state order provided for assembly of four aircraft, but there were plan to build 10 of them in 2004." The aircraft has been displayed in Slovakia, India, Algeria, Chile, Germany and Ukraine.

Yak-130's "counterpart", the Aermacchi M346, was shown at Le Bourget only in mock-up form

Yakovlev's contender Aermacchi also demonstrated its product at the exhibition. Despite the fact that the first prototype of the M346 aircraft was rolled out right on the eve of the air show, on 7 June 2003, the Italian firm exhibited the same mock-up that had been shown two years before. It plans to run flight tests of three prototypes. The first M346 prototype will take off in the fourth quarter of 2003, while the second in mid-2004 and the third in 2005. Serial production is expected to commence in 2007.

Despite similar looks, Yak-130 and M346 are quite different. The former is a combat trainer while the latter is a purely training aircraft that is likely to partake in the tender for the new generation European trainer; hence the difference in

engine specifications, as well as in manoeuvrability characteristics.

On the whole, the training theme was widely represented at the air show. The matter is that in Europe alone at least 500 trainers will have to be replaced in the near future. Air forces of 12 European counties are drawing up the requirements to the new training system for pilots of the 4th and 5th generation fighters (Advanced European Jet Pilot Training, or Eurotraining).

Previous generation combat trainers, namely Hawk Mk.102D and L-159, participated in demonstrations every day. EADS showed a mock-up of the Mako aircraft that, according to the advertisement, will be able to fly at angles of attack as big as 45 degrees. The Ukrainian Odesaviaremservice aircraft repair enterprise and Israeli IAI demonstrated jointly a modernised version of the L-39C trainer, designated L-39U. The aircraft is equipped with the AI-25TLSh engine and new avionics.

ROSVERTOL TO PHOCUS ON MODERNISATION

No wonder, the most interesting aerobatics stunt in the skies of Le Bourget was "the turn over the tail" demonstrated by the Tiger combat helicopter. Director General of the Moscow Mil Helicopter Plant Yuri Andrianov thinks that "our designers are worth their salt, too," and the Mi-28 is by no means inferior to European Tiger. However Mil and Rostvertol came to Le Bourget with the Mi-35M upgrade, and not with the Mi-28.

The Mi-24 family helicopters are in service with armed forces of over 20 countries around the globe, all countries having different financial capabilities. Therefore, modernisation of the existing fleet of helicopters both in Russia and abroad is a priority for the helicopter factories. "We are open for work and cooperation with firms manufacturing different types of equipment," said Andrianov. "If the customer wants to fine-tune something in our aircraft, we will take it into account, although we are sure that our design is the best," added he.

Pavel Naumenko, Director General, KSAMC - a company that brought An-74TK-200 and An-140 aircraft to the Le Bourget

Ilya Klebanov, Russian Industry Minister, at the cockpit of the Mi-35M mock-up

In 2003 Rosvertol modernised Mi-24s for the Russian Defence Ministry for the first time in the recent years. The military order has grown significantly as compared to the previous year. Besides, the company is going to modernise the Mi-2A helicopter. A corresponding agreement was signed by Rostvertol, Mil and Ukrainian Motor Sich two years ago. The modernisation provided for replacement of the engines (with AI-450 or Arrius IIC) and mounting of a new gearbox. The Mi-2 boasts a very attractive price, therefore, its production by Rostvertol seems to be quite profitable and will "allow us to retain the positions in the 3,500-kg helicopter market."

UKRAINE AT LE BOURGET

Unlike Russia, Ukraine demonstrated two aircraft at the show, namely the An-74TK-200 and the An-140. "Today we are presenting top-quality and competitive aircraft to the international market," said KSAMC Director General Pavel Naumenko.

The An-140 was first shown at Le Bourget. According to Pavel Naumenko, "we did not prepared the exhibit especially for the show, but withdrew the plane from routine operation and sent it."

On the eve of the show, on 23 May 2003, the enterprise delivered another An-140 to the Ukrainian Motor Sich company that became a third operator of such aircraft. In June-July the aircraft will start carrying passengers. KSAMC plans to build another eight aircraft in 2003. Moreover, four more An-140s will be assembled in Iran from components made by the Kharkov State Aircraft Manufacturing Company. In 2004, the production will grow by 1.5 times. Today options for the An-140 amount to 34 planes, including 15 from Ukrainian air carriers, 13 from Russia and 6 from Kazakhstan. Presently, the demand for the aircraft is estimated at 225 planes, 20 of which will go to Ukraine, 100 to Russia and 105 to Iran.

In addition to a large exposition of the Antonov company, Ukraine showed a new cockpit of the An-32 aircraft. Unique specifications of the plane explain its world-wide popularity. Now it is taking part in tenders in Greece, Poland, Pakistan and Brazil. However, the organic avionics suite does not meet present-day requirements. Therefore, the Kiev Aviant plant has made a cooperative effort with the Lahav branch of IAI and the LR Avionics Technologies company to modernise the cockpit of the aircraft. The cockpit, brought to the show, "was developed to demonstrate avionics of the aircraft with two crewmen instead of four." Moreover, there are plans to develop a simulator on its basis. Modernisation of the aircraft will consist both in equipping it with new avionics (TCAS, advanced radio), and in reducing noise by means of mounting new propellers, and introducing an emergency mode to engines, which will extend their service life from 6,000 to 20,000 hours. All these measures will make the aircraft quite competitive in the world market for another 10-15 years. Most of the work described is carried out in the interests of the Indian Air Force, but Aviant is ready to offer a similar modernisation programme to Russia, using the equipment of the Russian make.

WHAT'S AHEAD?

One can keep on talking about what was interesting at the Russian exposition at Le Bourget for quite long. Of special attention are the products by Tekhnokomplex, the K-36D-3.5 ejection seat designed by the prominent Zvezda enterprise, a superbly decorated Salut's stand, the MiG-29 simulator developed by RAC MiG, and the Flight International Prize award ceremony where the Siberia air carrier got the main prize… The only thing missing was Russian aircraft. They have traditionally been one of the best decorations of any major international air show.

No doubt, the Le Bourget show lost a lot by failing to solve all organisational and legal problems related to participation of Russian aircraft. We can only hope that two years will be enough to settle the dispute with notorious Noga. If so, Parisians and guests of the show will be able to enjoy the breathtaking flights of Sukhoi and MiG aircraft, demonstrating their unrivalled superiority over best foreign counterparts.

Andrey YURGENSON

KONDOR-E

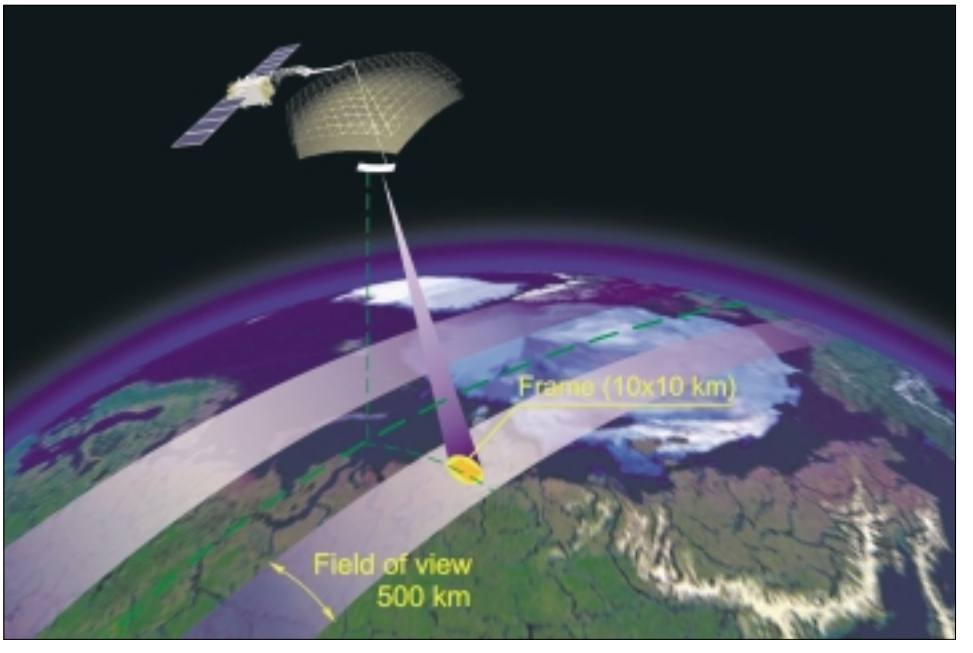
SPACE SYSTEM TARGETS INTERNATIONAL MARKET

More and more countries in the world look forward to gaining an access to space to effectively observe own territories and the regions of special interest for them. We fulfil such requirements.

The Kondor-E space system is a flexible source of remote data. It provides a variety of images and other types of data to satisfy a most demanding client.

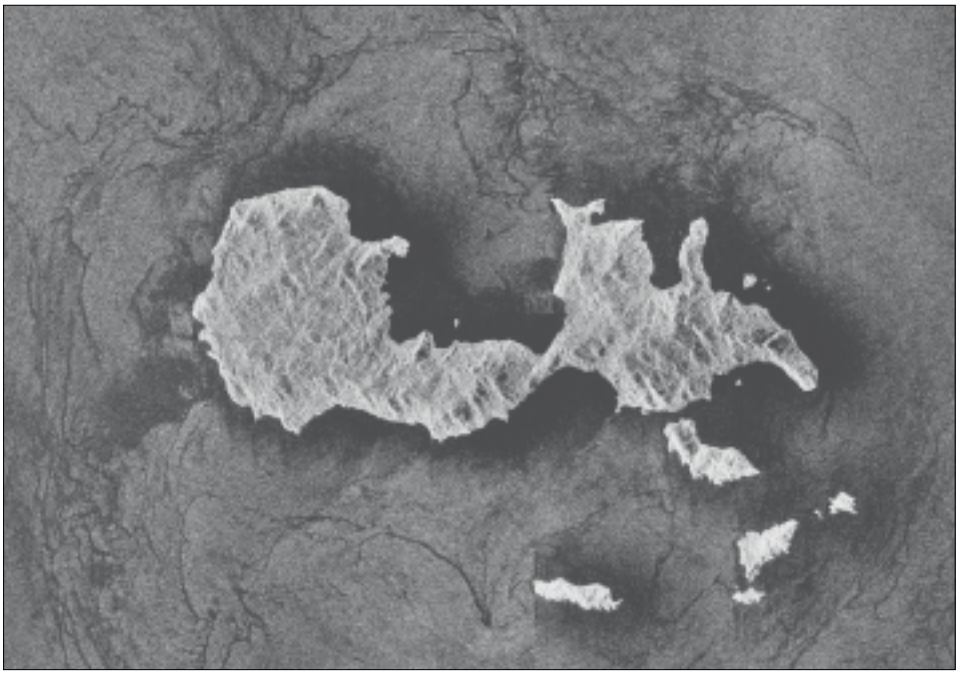
The Russian NPO Mashinostroyeniya science and production association with over 50 years experience specialises in development and putting into operation of a whole bunch of spacecraft. The enterprise will soon come up with the all-weather Earth Remote Probing system (ERP) comprising the Kondor-E small-size spacecraft.

The latter can be fitted with both synthesised aperture radar and electro-optical equipment. However, they will be installed on the same platform with the weight of up to 800kg (250kg payload) and the orbit of 500km.



The satellite is likely to be launched in 2004. It will provide confident imaging of the earth surface with resolution of about 1 metre in two 500-km wide observation lines to the left and right of the lane. Radar images will be transmitted to the Earth in digital format at a speed of 245 Mbit/s, almost real-time. There are plans to use interferometric methods of collecting and processing radar images to get 3D images of the earth surface and objects.

Simultaneously NPO is developing a small-size electro-optical probing spacecraft, whose launch scheduled for some time later though. It will be capable of transmitting images in the visible spectrum with resolution of about 1 metre with favourable illumination, as well as of producing IR imaging. The images gained by electro-optical systems are the most popular. They ensure high resolution and are very easy to decode.



Kondor-E also incorporates a ground-based element, consisting of the ground control centre, the central and regional data receiving and processing posts.

The spacecraft is expected to be launched from the Russian Svobodny Cosmodrome with the help of the NPO-developed Strela light class expendable launch vehicle, which is capable of launching such payloads to close orbits. The cost of the launch is one of the smallest in the world.

NPO offers the system either in a ready-to-launch composition or by modules, specially equipped for particular missions. Moreover, we can sell the results of the Earth Remote Probing in the format received from our satellites.

Kondor-E specifications make it possible to use remote probing in a wider range of tasks. Data obtained is employed in agriculture and forestry, cartography and land tenure, geology and natural resources prospecting, ecology, oceanic studies, ship navigation, monitoring of ice situation, etc. It is also suited for a range of military applications.

CAPTIVATING AMERICA

RUSSIAN NATIONAL AEROBATIC TEAM LEADS THE WORLD WITH NEW SU-26M3

April 2003 saw an event that has been left unnoticed by international mass media. The Sukhoi Design Bureau's test pilot Yuri Vashchuk took to air on yet another version of the Su-26 aerobatic plane that was to become a surprise for both fans and rivals at the aerobatics world championship held in Lakeland, Florida in June this year. Of 52 aircraft participating in the event 25 were of the Sukhoi make, namely Su-26M, Su-29 and Su-31.

Yuri Vashchuk, Sukhoi's test pilot to first fly on the Su-26M3

The Su-26 owes its appearance to the failure of the Russian national team at the XII aerobatics world championship held in Hungary in 1982. Back then Viktor Smolin, the absolute world champion, was only fifth. Employing the obsolete Yak-50 aerobatic plane, the USSR men's team had to sweat a lot to get the bronze medal.

This prompted the Yakovlev Design Bureau to design a new aerobatic plane designated the Yak-55. The Sukhoi Machine-building Plant followed suit. Designer General Mikhail Simonov suggested that a totally new aircraft designated S-42, later renamed Su-26. The main advantage of the new aircraft was the airframe's ability to withstand 12g.

The Su-26 was developed under supervision of Vladimir Kondratyev who earlier had worked for the Yakovlev Design Bureau. The aircraft was test flown by Yevgeny Frolov, a graduate of the school for test pilots of the Ministry of Aviation Industry and a former member of the USSR national aerobatic team. The Su-26 was undergoing factory tests while pilots A. Shpigovsky and R. Paksas were flying the machine for training.

After a long break Soviet sportsmen managed to win the 1986 world championship held in the UK thanks to the Su-26, and the plane has been our team's lucky token ever since. This year the Su-26M3 version brought our team another victory.

Outwardly, the plane differs but slightly from its predecessor, but if you take a closer look you will notice letters M-9F written on the engine cover. The new 420hp power plant comprising the engine based on the well-known M-14P and fitted with the VV-9 propeller is what differs the Su-26M3 from the predecessor.

Despite a major increase in power, the engine is only 6 kg heavier. Engine designers promise a further boost in the M-9F's power to 450 hp.

Before the Su-26M3 was sent to the USA it had been used as a flying laboratory to test the power plant. Since the new engine was more heating-prone measures had to be taken to provide better cooling, and a new oil radiator was installed. At the same time the steel engine frame was replaced with a titanium one; and that had to be tested in flight.

However, it is not only the new engine that differs the Su-26M3 from the production Su-26M. A glance at the cockpit tells us there is the SKS-94M ejection seat with a new parachute.

Prior to that, the seat had been installed in the Su-29 and Su-31M aircraft. Fitting the plane with the ejection seat called for a new design of the transparency. Also, the wingspan was increased, and modifications introduced in the wing profile and ailerons. In March 2003 the aircraft rolled off the assembly line and started flight tests.

After the first flight test pilot Yuri Vashchuk, full of admiration, could hardly hold his emotions. But it's a sportsman, not a test pilot, who will pull stunts at a competition. It turned out that sportsmen were just as pleased. For instance, according to Sukhoi test pilot Svetlana Kapanina, the plane is so powerful that you have to restrain it not to breach the limits. The plane flies smoother and doesn't roll in critical modes. The previous engine had to be virtually squeezed out to increase the vertical speed.

The results of the XXII aerobatics world championship in the USA are beyond expectations. When the results after the first stage had been summed up it turned out that the first four places were taken by Russian sportsmen. That was unprecedented. Sergei Rakhmanin was the first, while Svetlana Kapanina came second outperforming 40 best male pilots.

The Russian national aerobatic team owes much of the success to the Su-26M3 aircraft. Now that the championship is over, the plane will be fitted with a number of sensors and will continue with the tests to be over after the MAKS 2003 international aviation and space salon. Certification tests of the M-9F engine will continue as well.

The Su-26M3 is a transitional stage in Sukhoi's long-term sports plane development programme to be crowned in 2005 with the new generation Su-126. According to Chief Designer Boris Rakitin, Sukhoi has chosen the right way of aerobatic aircraft development.

Nikolay YAKUBOVICH

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VERSATILE FRONTLINE WARPLANE

WELL-KNOWN AND UNHEARD-OF FACTS ABOUT YAKOVLEV YAK-28 FAMILY

The world aviation history knows few examples of warplanes that could boast such versatility of combat employment as the first production supersonic aircraft by the design bureau headed by Alexander Yakovlev for quite some time. We speak here of the twin-engine jet aircraft with swept back wing and unprecedented bicycle landing gear, known as the Yak-28. Developed initially as a bomber, it was derived into a reconnaissance version, an electronic warfare aircraft, an attack warplane and even an interceptor fighter. Also, it had a chance to play the part of a "postman" when employed to deliver matrixes of the Pravda newspaper to Leningrad (St. Petersburg). Here is a brief story of the unusual fate of the aircraft laid down by a prominent historian of the Russian aviation Nikolay Yakubovich.

BOMBER

In spring 1956 OKB-115 headed by Designer General Alexander Yakovlev started development of a light supersonic tactical bomber, code-named "aircraft 129". At that time nobody even expected that the aircraft would soon be derived into a whole Yak-28 family of warplanes. According to the order, the aircraft-to-be had to feature the maximum speed of at least 1,500km/h, effective range with a 1,200kg payload of 2,200-2,400km and service ceiling of 16,000-17,000m. Moreover, it was to have a run of less than 1,000m and roll of 1,100m, with the maximum payload of 3,000kg.

A "129" prototype powered by R11A-300 engines was rolled out in 1957, with the airframe of its predecessor, the Yak-26 supersonic bomber, manufactured in small series. On the face of it, it seemed that 129 differed from Yak-26 in its engines only, the air-intakes of which had sharp-coned central bodies, signifying that it could reach higher supersonic speeds. Another feature was a higher position of wing to increase the bomb compartment considerably. The new design didn't allow for installation of the rear gun mount although there were plans and orders.

Top: One of the last Yak-28 versions, the Yak-28PP ECM aircraft

Yak-28s at the assembly hall of the Plant No 39 in Irkutsk

Yak-28L bomber with Lotos radar-rangefinder system

On 5 March 1958 test pilot V. Volkov and navigator N. Shipovsky took the experimental Yak-28 off for its maiden flight. Already factory tests proved that the aircraft met all the requirements except for the range, which was 400km less than expected. Also, there were complaints about stability at big angles of attack, lack of effectiveness of ailerons when climbing at a speed of 900km/h and inconvenient location of devices in the navigator's cockpit.

Following this, the customer drew up a list of measures to be taken before sending the aircraft for official trials. Moreover, it was necessary to install ejection seats for the crew to be able to escape in emergency at a speed of up to 2,000km/h, and to ensure aircraft operation from unpaved airfields. To crown it all, the RBP-3 radar bomb sight was to be fitted and later replaced with the more sophisticated Initsiativa-P2 radar or Lotos radar rangefinder system, as well as some other equipment. As the NR-23 guns were taken out of service, Yak-28 was armed with the fixed GSh-23 twin-barrel cannon in the nose section.

Fine-tuning of the aircraft took quite some time, and only in September 1959 it was ready for official trials. The governmental commission was headed by Hero of the Soviet Union Major General L. Zholudev, who piloted the aircraft several times. All test flights were performed by test pilot F. Sobolevsky and test navigator A. Khalyavin.

The trials went successfully except an accident that occurred when trying to fly at the maximum range. The crew had to crash-land due to leakage of fuel. The aircraft was damaged but restored and returned to service.

The tests still underway, the new bomber was put into production at Plant No. 39 in Irkutsk. The first serial Yak-28 was powered by the R11AF-300 engines without power augmentation control. Until 1961 the plant assembled 42 aircraft, five of which were equipped with the RSBN-2 Svod short-range navigation system and the remainder were modified into Yak-28B with the RBP-3 radar sight. Almost all Yak-28Bs were used for combat training.

An interesting fact is that in autumn 1959 there were plans to set the following world records on the Yak-28: to fly a closed 1,000-km loop at a speed of 1,200-1,300km/h, and to fly a 2,000-km route at an average speed of 1,000km/h. However, neither of the dreams came true.

During a joint test, the governmental commission came to a decision to replace the radar and optical sights of the third prototype with the Lotos radar rangefinder system. Operating jointly with two external radio stations, Lotos allowed attacking targets with the FAB-1500 bombs at speeds up to 1,500km/h. At the same time the designers managed to increase fuel capacity and fine-tuned the power plant, making the air intakes of engines elliptic.

Equipped with Lotos, the bomber received designation Yak-28L. Its weapons suite initially consisted of the NR-23 gun and free-fall bombs of 100-1,500kg in calibre. In 1964 the gun was replaced with the GSh-23L cannon.

It took a mere four months to fine-tune the aircraft, and the flight tests were completed in January 1960. The weakest point of Yak-28L was the smaller field of view in the forward hemisphere from the navigator's cockpit. It became impossible to solve the problem entirely. Also, there were complaints about inconveniences when attaching bombs, as the aircraft virtually had to be rolled on the bomb cart. In spite of this the aircraft was adopted for service with the Air Force in November 1961. By 1964 the Air Force had received 67 Yak-28Ls.

Almost at the same time, the Yak-28I bomber was undergoing tests with coupled Initsiativa-2 radar and the OPB-11 optical sight. The prototype was built in late 1960. The R11F-300 engines were replaced with the R11AF2-300 ones with all-mode jet nozzles and rounded air intakes, while the fuel capacity grew by 1,000 litres. Tuning of the airframe resulted in the growth of its length by 550mm.

In May 1962 the version went for official trials to the Air Force Scientific and Testing Institute, and already on 28 August the aircraft crashed when performing a flight with autopilot, due to the buffeting at an altitude of 1,300m. It turned out that the accident was due to instability of the control loop: rate of pitch sensor – autopilot gear – elevator – "elastic" aircraft.

The tests of the Yak-28I took quite some time. In November 1963 the second production aircraft came to the institute, and in April next year the third Yak-28I came. During the tests of the bomber a number of defects were revealed that demanded hasty elimination, including buffeting of the aircraft in flight with open hatch of the bomb compartment at M=1.2-1.4 and altitudes of 10,000-12,000m, and stalling at 7,500m at an indicated speed of 450-650km/h.

Test pilot of the Yakovlev Design Bureau Yury Petrov met with an interesting accident during the tests. When performing a task of ruling out limitations of piloting the aircraft, he pressed the button of dropping expendable fuel tanks at a speed of 1,000km/h. However, only one of the tanks fell down, and the other one did not, no matter how hard he tried. The option was to either land with one tank (which was unprecedented for the aircraft of the type) or escape. The pilot chose the first and approached for landing though the risk was big. Fortunately, all ended well when on the third turn the ill-fated tank dropped down. If that had happened on the roll, the crash would have been inevitable. Nevertheless, in 1964 first Yak-28Is were rolled out from assembly shops. For long years afterwards they were in service with tactical bomber aviation of the USSR Air Force.

Yak-28I bomber with Initsiativa-2 radar

Yak-28R reconnaissance aircraft

RECONNAISSANCE AIRCRAFT

In late 1960 the design bureau took up modifying the Yak-28 bomber into the Yak-28R reconnaissance version, with the first prototype built in September 1962 on the basis of a Yak-28L. The final version had a reconnaissance equipment compartment divided in three sections with glass hatches for photographing.

The aircraft underwent trials from September 1962 till March 1963. Two years later the Yak-28R was put into production at the Irkutsk aircraft plant. The first batch of the planes had photographic reconnaissance equipment and differed from other Yak-28s in the wedged fixed part of the cockpit canopy aimed to improve view in the front hemisphere.

In 1963 another reconnaissance version was rolled out, the Yak-28BI, featuring side-looking synthetic aperture surveillance radars and the Initsiativa-2 radar sight. It was then that the aircraft was put into production, with 50 of them built by late 1964. All the factory tests were run by pilot Yu. Petrov and navigator N. Shipovsky. Later on the reconnaissance versions were fitted with the Kub-3 and Romb-4A (4B) electronic reconnaissance equipment. From 1965 till 1970 a total of 188 Yak-28Rs were built in Irkutsk.

In the mid-1960s ten Yak-28Ls were modified into Yak-28RR radiation reconnaissance versions with FUGA filtering pods for taking samples of air.

COMBAT TRAINER

The Yak-28B was derived into the Yak-28U ("129U") combat training version. It was powered by the R11AF-300 engines with two-position nacelles and uncontrollable afterburner. The Yak-28B was deprived of bombing equipment and armament and some other stuff. Moreover, the bomb compartment was to be open and closed only when grounded. A 1,350-l fuel tank was installed in it.

The aircraft completed tests in February 1962. Military pilots said steering of the Yak-28U did not differ from that of the Yak-28B version. There were ideas to use the trainer in pilot schools. However, before it could be done, according to Air Force Commander Marshal Vershinin, the run and especially the roll should have been reduced. Nevertheless, in the 1970s the Yak-28Us were employed for training of pilots at the Barnaul-based Air Force college. The version had been mass produced by 1968 with a total of 187 aircraft assembled.

The following incident occurred with the aircraft that remained concealed. A well-known Soviet sculptor Anikushin told Alexander Yakovlev that the Pravda central Soviet paper came to Leningrad too late. Many people in the city were also irritated with the fact. The matter was that in the 1960s, when no one knew of e-mail, the papers were printed from matrixes brought from Moscow by Il-12 and Li-2 aircraft, and reached the readers only in the second half of the day.

That was an interesting thing for Yakovlev, and he asked the designers to think over the variant of delivering the matrixes to Leningrad with a jet aircraft. After the Yak-28U trainer had been chosen for the role, the designers had to fine-tune the cargo compartment. The designers' idea was to make it possible to deliver the matrixes with landing in airports and by dropping them in the place set in advance, for which a special container was developed.

Test pilot Yu. Petrov and navigator N. Samokhodkin were entrusted with a mission of testing the renovated Yak-28U and delivering matrixes. At that time Samohkodkin was head of the Communist party cell, so the mission was in line with his position. To accomplish the mission, the aircraft was ferried to the Sheremetyevo airport, where there was a parking area of the Yakovlev firm.

The first "brainstorming" flight to Leningrad took place on 2 September 1964 ending with landing at the Shosseynaya airfield. The next day the flight was repeated, but at the supersonic speed. It took a mere 25 minutes. As a result, people of Leningrad received the paper early in the morning.

Also they tested a variant of matrix delivery by dropping the container at the final leg. Exactly after the first try an anecdotic incident occurred. After approaching the final leg the navigator pressed the button to drop the container. Upon returning to Sheremetyevo the crew was about to receive a dressing-down from Chief Designer K. Bekirbayev who said the container had been missing at the drop site.

It turned out that the search group did not find it at the expected dropping place. There was no container in the aircraft either. A "political row" was in the air with the ensuing consequences. However, everything ended well. About three hours later the responsible authorities in Leningrad reported that the container had been found at last.

Yak-28U combat trainer

It crashed into one of triangle wooden shields that indicated direction of landing approach.

Later, the container was improved, and equipped with light and sound signals. Operation "Pravda" was successfully completed in October that year, but did not get popular. It seems that the political leadership of the country decided that the citizens of Leningrad could wait for fresh information for some time, so they employed the good old way of transporting the matrixes.

Yak-28SR experimental "dispenser" aircraft

DISPENSER, JAMMER, ETC.

The Yak-28SR aircraft was derived in 1963 from the Yak-28L version to dispense liquids and powders from small altitudes. The aircraft was equipped with two types of containers for chemicals with dispensing devices. It also could be employed as a bomber. Factory flight tests (pilot Yu. Petrov) revealed no weak points, but on 1 October an accident took place during official trials. At an altitude of 90m at a speed of over 800km/h the aircraft collided with a flock of birds breaking the windscreen. The distorted fixed part of the canopy caused damage to transparencies. With severe face injuries, seeing almost nothing, Major B. Lvov managed to bring the aircraft to the airdrome and land it successfully following commands by the navigator. As a result, the version was not put into production.

As was mentioned before, the take-off/landing characteristics of the Yak-28 left much to be desired. Due to this fact, the early 1960s saw testing of an aircraft with a booster and two brake chutes.

Also, a project was underway to develop the Yak-28VV twin-seat VTOL aircraft. It was expected that powered by two R27AF lift/cruising engines and four R39P-300 lift ones the aircraft would be able to deliver up to 1,200kg of bombs to the target with the flight weight of 18,000kg. It was to reach the top speed of at least 1,700km/h and the ceiling of 18,000m.

One of the last modifications was the Yak-28PP jammer. The prototype was derived from the Yak-28I in 1965. The aircraft was designed for ECM applications, and at different stages was fitted with the Buket, Siren, Strela and Fasol active jamming systems. KDS-19 chaff/flare dispensers were mounted under nacelles, while S-5P projectile launchers, intended for the same purpose, were fitted under wings. By 1971 a total of 84 Yak-28PP aircraft had been built in Irkutsk.

INTERCEPTOR

The Yak-28B was modified into an interceptor following the same pattern as the Yak-25 was converted into a bomber from a patrol interceptor. Such metamorphoses were easy to explain, as configurations of the two fully met the requirements for a versatile aircraft. However, the reverse modification with increased number of flight modes brought about a number of incidents and crashes.

Upgrading the Yak-25M interceptor, OKB-115 developed the Yak-28P intended to counter aerial targets at low and medium altitudes. The aircraft was rolled out for tests in July 1962. Despite the unchanged aerodynamics configuration, the Yak-28 featured considerable alterations, especially where the airframe was concerned. The nose housed the Orel-D radar under the radio-transparent radome. The radar ensured detection and tracking of targets at altitudes from 500 to 20,000m. The navigator was replaced with the operator, who was seated behind the pilot. The underwing gun mount was replaced with launchers for two K-8M (K-98) missiles, capable of killing targets flying at speeds of up to 1,800km/h.

The Yak-28P was equipped with the K-5 ejection seats developed by the Yakovlev Design Bureau for supersonic aircraft. Initially, the seat was fitted with a folding metal visor. However, high malfunction probability was the reason for its modification. It is remarkable that for the first time in the history of bombing aviation pilots were dressed in flight suits, protecting them against depressurisation and airflow during ejection.

The Yak-28P with K-8M1 and K-98 missiles was recommended for adoption for service in 1964. In late 1963 the first batch of aircraft came for field tests to the Air Defence Aviation Combat Employment Centre at the Savasleyka airfield. However, before the tests were over, Plant No.

Yak-28P interceptor of the 82nd Guards Air Defence fighter regiment at Nasosnaya airfield, late 1960s

Yak-28P upgraded interceptor on display at Domodedovo air show, 1967

153 in Novosibirsk started production of the aircraft. From 1962 till 1967 the plant assembled 443 interceptors.

Before crashes of interceptors, the Yak-28 family suffered six accidents from 1961 till 1964. One of the crashes occurred on 13 April 1962. On that fatal day, the lid of the upper hatch of the left engine air intake tore off, jamming the actuator of the engine throttle. According to statistics, Yak-28's mean time to failure grew from 860 hours in 1961 to 12,578 hours in 1964, but when the Yak-28P became operational the index dropped.

On 12 February 1964 the first Yak-28P was lost. The reasons of the crash remained unclear. In March and September next year during night flights another two aircraft crashed. At the same time, a number of earlier unknown peculiarities of steering and piloting at near-sonic speeds and close to service ceiling altitudes were revealed when engines operated without afterburner. Additional research was necessary.

The new year of 1966 saw several crashes. On 12 January during a nocturnal interception of a target at 1,800m a fourth Yak-28P fell down. Two months later, on 11 March another interceptor crashed in similar situation. The five aircraft were presumably lost because of getting into the area of longitudinal instability. Revealed during tests of the Yak-25 interceptor, this drawback was eliminated in good time. In March and April 1966, another two Yak-28Ps were lost. The reasons were malfunction and breakdown of engines.

It was then that shortcomings of emergency escape systems were revealed, too. Of the 12 ejections from the Yak-28P aircraft by September 1966, only two didn't result in casualties or injuries.

Accidents were observed during the tests, too. For example, in 1968 after the K-8M missile was launched, powder gases were sucked into the air intake, causing an engine shutdown. It was the first case with the Yak-28 aircraft, and test pilot Yu. Petrov made a safe landing at the airfield. Recommendations on how to perform such landings were sent to manoeuvre units.

As to the Yak-28P service, they underwent it for example in the Safonov fighter regiment, which received the first Yak-28U in July 1964. Two months later the Yak-28P replaced the Yak-25M in the regiment. Scrambles are not rare in AD aviation. They would normally end up with sabre rattling, but there were exceptions. For example, on 14 December 1969 the Yak-28P piloted by Captain V. Chernega shot down a gliding reconnaissance balloon above the sea. Similar incidents were in other AD regiments, too.

On 20 July 1962 a prototype of the Yak-28PM interceptor armed with four K-8M missiles was completed. At the same time, the Novosibirsk plant built another two aircraft. The prototype was powered by the R11AF-300, and in 1962, when more powerful R11AF2-300 engines were installed, test pilot Yu. Petrov reached the speed of 2,400km/h.

There was a project of a Yak-28-80 interceptor armed with two K-80 missiles, powered by R21-300 engines and equipped with the Orel radar sight featuring detection range of up to 50km. It was expected that with the flight weight of 16,000kg the speed would be 2,130km/h, service ceiling 19,000m and flight time 2.7 hours. The aircraft was developed at the same time with the dedicated Tu-28-80 interceptor, designed to carry four K-80 missiles, and featuring almost the same flight characteristics, but with a bigger flight weight.

In August 1964 the Yak-28P was modified to carry two Kh-28 anti-radiation missiles (range of up to 110km). The modification was designated Yak-28N (Yak-28-64). It was to fly at a speed of 1,700km/h and feature combat radius of about 1,100km. The factory tests started on 5 November that year. At the same time drafts of the second version of the aircraft were developed, featuring engines moved from the wing to the fuselage, which demanded a considerable reconstruction of the latter. However, the aircraft did not prove expectations of the designers.

The Yak-28P interceptors were operated by the AD units for 20 years, but they were never officially adopted for service. In the 1980s they were replaced with considerably more sophisticated Su-27 fourth-generation fighters.

Nikolay YAKUBOVICH

Primary specifications of some Yak-28 modifications

	Yak-28L	Yak-28R	Yak-28P
Engines	R11AF-300	R11AF-300	R11AF-300
Thrust, kgf	2x5,750	2x5,750	2x5,750
Length, m	20.02	20.02	20.6
Wingspan, m	11.78	11.78	11.78
Wing area, m^2	35.25	35.25	35.25
Normal take-off weight, kg	14,600	15,500	15,980
Fuel capacity, kg	5,050	6,750	5,590
Maximum speed, km/h:			
at 12,000m	1,830	1,804	1,840
near ground	1,070	1,070	…
Service ceiling, m	15,600	15,600	16,000
Range of flight without external fuel tanks, km	1,770	1,770	2,150/2,700*
Take-off run, m	1,150	1,150	1,300-1,450
Landing roll, m	900-1,000	900-1,000	1,150-1,200
* with external fuel tanks			

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